RAILROAD GAZETTE

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Contributions

Classifying Locomotives.

Bombay, Baroda & Central India Railway,
Rutlam, Central India, March 13, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

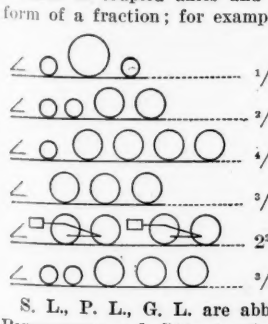
Referring to "Roadmaster's" and "Superintendent's" letters on classifying locomotives in your issue of Dec. 7 and Dec. 28, 1900, I would suggest what seems to me a very simple and yet perfectly clear method of classification, viz., that given here. It is applicable to any kind of combination and is both easy to write and easy to talk of, which some of the descriptions proposed are not. Further information can be added if necessary by adding S or C (for simple or compound) and the number of the cylinders. Thus, Webb's 4-cyl. compound express engine would be described as Class 2.2.0. C4.

ASSISTANT ENGINEER.

Hanover, Jan. 25, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

May I point out, referring to your article about classifying locomotives, in the issue of Dec. 7, 1900, that in Germany prevails, for some years, another very simple method, which seems more adapted to easy pronunciation than that of "Roadmaster," and which is gaining favor more and more in Europe? It is based on giving the number of coupled axles and total number of axles in form of a fraction; for example



S. L., P. L., G. L. are abbreviations for Schnellzug, Personenzug and Güterzug Lokmotiv, as the case may be. The $2^2/_2$ G. L. class is the Mallet type locomotive.

E. METZELTIN.
Kgl. Regierungsbaumeister.

New York Approach for the New East River Bridge—A Diagonal Street.

Brooklyn, April 15, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I have been studying the question of approaches to the new East River Bridge ever since my connection with this structure. The inlets and outlets to such a bridge are all important. The bridge has a width of 118 ft., it will carry four trolley tracks, two elevated railroad tracks and two roadways, each 20 ft. wide. The first thing to consider in establishing these inlets and outlets is that they shall adequately afford an unobstructed passage to all vehicles that use the bridge. For this purpose it will not do to attempt to make use of streets that are already congested with traffic. It is better to have new streets until the traffic of the bridge is sufficiently distributed to enable the lines now occupied to take care of it.

The traffic of the Manhattan streets, especially of those up and down town, are already considerably congested, and in a case like this bridge it is better to so arrange matters that Brooklyn passengers, traveling to or from Manhattan shall do as much of their traveling in Brooklyn itself as possible, so that in going to Manhattan they can take that bridge that will land them at a point in Manhattan where they wish to go, thus relieving the street car lines as much as possible of this traffic. At present, having but one bridge, many people in the southern part of Brooklyn take the New York and Brooklyn Bridge, especially when they wish to go down town in New York, and also many cross over and take the Fourth avenue and Broadway cars to go uptown. In other parts of Brooklyn there are many who take the Broadway Brooklyn ferries to go either up or down town in New York. When the new East River Bridge is completed I apprehend that these conditions will be changed, and still more so when Bridge No. 3 is completed. At that time the present bridge and No. 3 will accommodate those going down town and the new East River Bridge will to a great extent be used for uptown and cross town traffic.

It is for this reason that I consider the diagonal street necessary to go from the bridge plaza to the intersection of Third and Fourth avenues near the Cooper Institute. This would cut several avenues and in connection with Fourth avenue to Union Square and thence by Broadway northward will be equivalent to a diagonal street nearly across Manhattan Island. In the other direction southward in Manhattan we have Madison street and East Broadway, which would form very good outlets. Should we depend upon widening Delancey street to the Bowery as our outlet we should arrive at the most congested point on the Bowery, and no relief be afforded to that street as for a cross-town line Delancey street would not very well serve the purpose. At the Bowery it would be necessary to turn northward and then westward on Spring street. I think that Broome street would be the best for cross-town purposes, as it is direct, and much of the way is already wide enough, besides having at present no railroad except for a short distance, and this street bounds the south side of the plaza at the end of the bridge. It is quite possible that it would not require widening at all.

For these reasons I consider that the diagonal street would be a decided improvement, and I certainly recommend its construction. I judge that this diagonal street would not cost more than $5,000,000, and it would be a grand addition to the streets of the city, quite apart from its connection with the bridge.

L. L. BUCK,
Chief Engineer.

The Atchison Draft-Gear Tests.

The Westinghouse Air Brake Company,
Eastern Office, New York, April 13, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Referring to the report of the Atchison, Topeka & Santa Fe draft-gear tests, published in your issue of Feb. 22, I do not believe a careful analysis of the results of these tests warrants the conclusions expressed in your editorial comments, if my impressions are correct in the respect that you assume the four points discussed below to have been established.

1. That double-spring draft riggings are a great improvement over the ordinary arrangement.

To establish this point, comparative tests of the ordinary (single-spring) and double-spring arrangements must be made, otherwise the *relative* merit of the two devices is a matter of opinion or conjecture. So far as known, such comparative tests have not been made; and, while some may be disposed to assume that the double-spring device must be better, until tests have been made, showing, first, the benefits of the added spring capacity, and, second, the effect of the additional recoil, no comparison of relative merit can be made. I therefore think the Santa Fe tests do not establish this point.

2. That the double-spring device has withstood, without breakage of couplings, as severe tests as those to which the friction draft-gear has been subjected.

As to this contention, by referring to the tests in question, it will be noted that the tractive power of the locomotive operating the Pittsburgh Union train, equipped with friction draft-gear, was fully 55 per cent. greater than that of the locomotive used in the Santa Fe tests of spring draft-gear. As the greatest strains exerted in these experiments were developed in the starting or "jerk" tests, it will be seen that the friction draft-gear was subjected to stresses 55 per cent. greater than the spring draft-gear. Moreover, in the friction draft gear experiments, sand was used in jerk tests, thereby greatly increasing the effective tractive power of the locomotive. The report of the Santa Fe tests does not mention the use of sand.

The Santa Fe report states that, for the purpose of making the conditions comparative, two locomotives of about the same united capacity as the single locomotive in the Pittsburgh Union train tests were used in tests with a loaded train. It should require no argument to convince anyone that it is impossible to jerk a train as severely with two locomotives as with a single engine having a tractive power equal to the two combined. Again, in the tests with the two engines, it is to be noted that every car in the train was heavily loaded, while in the Pittsburgh Union tests the cars were all empty. The data given in the report of the Santa Fe tests show that this train weighed 2,459 tons, or 1,872 tons for the 32 cars forward of those on which brakes were applied. The Pittsburgh Union train weighed but 585 tons forward of the braked cars. The impossibility of producing, with the same locomotive power, as severe jerking strains with the heavier train as with a train of practically equal length but less than one-third the weight and consequent inertia, is too obvious for comment. It should, therefore, be entirely clear that, on the basis of the recorded tests, the spring draft-gear has *not* stood or been subjected to as severe tests as the friction draft-gear, without breakage of cars or draft gear.

3. That the Santa Fe tests show conclusively that it is possible to have a spring draft gear of comparatively small spring capacity, so that the recoil is not likely to cause damage, which, in connection with dead blocks, will meet the extreme requirements of service.

Relative to this point, I fail to find anything in the Santa Fe tests proving conclusively that a draft gear of comparatively small spring capacity in connection with dead blocks will meet the extreme requirements of service. I have had considerable practical experience with the operation of trains, in regular service, employing a draft gear of the kind described, and, under conditions that commonly occur in such service, perfectly sound M. C. B. couplings were frequently broken; and I am therefore confident that the Santa Fe tests do not represent the extreme requirements of actual service. Furthermore, it would appear that, in regular service, an entirely satisfactory draft appliance should at least reduce the shocks to a degree that will furnish no good reason why a conductor should not ride in a caboose on the end of a freight train.

4. That these tests form a basis for fair comparison of the relative merits of the double-spring and Westinghouse friction draft-gear.

If I am correct in the conclusions I have stated there remains no ground for a discussion of the fourth point, for reasons already set forth.

I would again call attention to the fact that the principles involved in the Westinghouse draft-gear are distinctly different from those involved in any spring draft gear. The chief feature of the improvements in design of spring draft gear attachments is the provision of a sufficient strength-to resist, without breakage, the strains to which they are subjected, the springs affording a partial but inadequate cushion for these strains. There is no provision for dissipating or diverting the energy which produces the strains, for whatever energy is absorbed by the springs during a movement in one direction is simply stored there and is subsequently returned by reaction, in full measure, to cause movement and corresponding strains in the opposite direction. The effect is therefore that of destructive shock, which ultimately manifests itself at the weakest point of the car construction. The purpose of the friction draft-gear, which can be attached to the car as strongly as the spring gear, *is primarily to receive, absorb and dissipate, in the form of non-returnable friction*, a large part of the strain-producing energy inseparable from starting, moving and stopping trains, thus avoiding recoil and relieving the car structure itself from the excessive strains arising from suddenly accelerated or arrested motion. It also provides the slack motion necessary in starting heavy trains. While the strengthening of the spring draft-gear attachment may result in transferring the point of breakage from the draft-gear proper to the coupling itself, or to some other member of the car, this change does not to any extent remove or lessen the actual *cause* of damage and therefore does not eliminate the objection or meet the existing requirements, which demand not so much an increase in the strength of the weakest part, always difficult and often impossible of attainment, as a reduction of the excessive strains imposed. The friction draft-gear is designed to accomplish the latter fundamental purpose and all the facts developed in severe tests and extensive applications warrant the belief that it realizes, in a practical manner, the theoretical advantages of the invention.

H. H. WESTINGHOUSE.

Railroad Legislation in Texas.

The Twenty-seventh Texas Legislature, just closed, passed six laws affecting railroad interests.

Senate Bill No. 30.—Railroad companies having charters granted or amended since Jan. 1, 1887, which have failed to construct their roads within the time prescribed by law, have two years from March 12, 1901, in which to complete their lines.

Senate Bill No. 16 amends Article 4445 of the Revised Statutes, authorizing railroad companies to ac-

quire right of way for reducing grade and shortening line, so as to permit such companies to also acquire land for reservoirs; and such real estate acquired need not adjoin the right of way.

Senate Bill No. 35 provides that the venue of suits brought against railroads for damages on account of personal injuries shall be brought in the county where the injury occurred or in the county where the plaintiff resided at the time of the injury.

Senate Bill No. 298 provides that bonds may be issued on the extensions and branch lines of railroads, without reference to the capitalization of the portion of the line previously constructed.

House Bill No. 470 provides a penalty for railroads when they permit Jounson grass or Russian thistle to go to seed on their right of way.

Senate Bill No. 54 extends the police powers of the Railroad Commission, by providing a penalty not exceeding $5,000 for violation of any provision of the Commission Act made thereunder, when no penalty is otherwise provided.

Proposed Entrance of the Gould Roads Into Pittsburgh.

It has been a generation since Jay Gould endeavored to obtain connection for his Western railroads with the city of Pittsburgh. A syndicate, headed by his son, is now making practical effort in the same direction. In round figures $20,000,000 has been subscribed by George Gould, Gen. Louis Fitzgerald, Col. Myron T. Herrick, Washington E. Conner, one or two syndicates having local interests in Pittsburgh, and a group headed by Joseph Ramsay, of St. Louis, to extend the Wabash system eastward from Toledo. Control has been obtained of the Wheeling & Lake Erie Railroad extending from Toledo to Wheeling, penetrating the coal fields of southeastern Ohio and having connection with the manufacturing plants located in the Ohio Valley. A year ago preliminary surveys were made for a new line leaving the Wheeling & Lake Erie in the neighborhood of Jewett, extending thence to the Ohio River at Cross Creek and across Washington and Allegheny counties of Pennsylvania to the Monongahela River. A charter has been obtained for a bridge across the Monongahela, and a strip of real estate has been bought in part running from this river over something less than half a mile to Liberty avenue, one of the principal thoroughfares of Pittsburgh. An ordinance granting right of way through the city is now before Pittsburgh Councils, and further procedure awaits its passage. The approach to the river is obstructed by the bluff known as Duquesne Heights, which it is proposed to tunnel by a double-track excavation 3,200 ft. long. This will open directly upon the approach to the bridge, which will be double track of a single span 800 ft. long and 80 ft. above the normal level of the river. The tracks from the bridge will run on an elevation of 30 ft. above the street to Liberty avenue terminal, where it is proposed to erect a handsome passenger station.

The entrance to Pittsburgh is sought, of course, to obtain for the entire Wabash system a greater participation in the vast tonnage originating in that district and a longer haul. It is reported that contracts for a large portion of their traffic have been made with the Carnegie Company and the Pittsburgh Coal Company. It would seem, however, that freight connection with the mills and mines will be exceedingly difficult and expensive. Between Duquesne Heights and the Monongahela River is but a narrow stretch of land already packed almost solid with mills and the tracks of other and naturally hostile railroads. Even if space for tracks could be obtained in this narrow stretch they would have to be connected with the tracks leading into the tunnel some 50 ft. above. Real estate in addition to that already acquired on the northern side of the river sufficient for even a yard of limited capacity would mean the condemnation of solidly built blocks. The approach to Duquesne Heights is over land that would afford room for extensive yardage, but as this is remote from the plants where the bulk of freight originates, extended and expensive connecting lines would be necessary. So far as the *Railroad Gazette* can learn the problems presented by these difficulties have not been worked out. One of the Pitsburgh papers published a description of a ten-story freight receiving and despatching station, the plan being to hoist freight cars up and down between the tracks and the 10 floors, upon any one of which they are to be loaded and unloaded. It is also rumored that the river, upon which the most extensive manufacturing plants are located, will be utilized by means of ferries upon which loaded cars will be carried to and fro, to be lifted by hoists to the tracks above. The realization of such plans which do not seem to have emanated directly from the syndicate would be what is called monumental engineering.

Following is portion of an interview with Joseph Ramsay, Jr., Vice-President and General Manager of the Wabash, which appeared in a Pittsburgh paper. Its authority has since been confirmed to the *Railroad Gazette* from an official source. Of the proposed plan he says:

"It is backed up by the 10,000 miles of railroad controlled by the Gould family, which reaches to all parts of the Southwest, including St. Louis, New Orleans, Kansas City, Omaha, El Paso, Ogden and Denver. There will not be a grade crossing within the city limits, and we propose to build as fine a road as it is possible to construct. We will erect a handsome passenger station at Liberty avenue and Ferry street, and will construct one of the greatest railroad bridges of the kind in the country over the Monongahela River. * * * *

"As soon as we secure our ordinance we propose to start building at once. We will construct a double track system in Pittsburgh and as far out at first as Chartiers Valley. Our bridges will be double tracked and so will our tunnels. We will try to avoid the mistakes that were made on so many roads, and which now require such enormous expenditures to make them straight and modern. Our surveys were made long ago, and we have secured a grade that will not exceed 35 feet to the mile to the Ohio River, and west of that we have a grade of 26 feet to the mile and less. The grade of the Panhandle is 52.8 feet to the mile.

"Our line is practically free from heavy curves and we have less curves than any line in Western Pennsylvania. We have endeavored to make the route as straight as possible and will connect with the Wheeling & Lake Erie at a point three miles south of Jewett, in Harrison county, Ohio, provided we decide to use the Wheeling & Lake Erie as part of our main line. We could build the line 10 or 15 miles shorter by constructing our own road to Toledo independently of the Wheeling & Lake Erie, but even by using the latter system our route to Toledo will be 10 miles shorter than the Pennsylvania, and the distance to Chicago will be the same.

"I have not yet made careful estimates of the cost of the new project, but it will be in the neighborhood of $6,000,000 or $7,000,000 to the Ohio River. We are preparing plans for a great bridge across the Ohio at Cross Creek. We expect to build under the present arrangement about 60 miles of new road, double-tracking that portion which will develop the coal fields in Western Pennsylvania.

"The Pittsburgh and Toledo syndicate has bought absolute control of the Wheeling & Lake Erie and, of course, we will use the valuable portions of that road. We will have a perfect line out of Pittsburgh and we propose to complete the new portions within 18 months, if it is at all possible. We have finished surveys for a line that will take us in a direct route to Toledo, but we have not yet determined to build it. We may use the Wheeling & Lake Erie main route. The syndicate is controlled by Gould interests and the new road will be operated in harmony with the Wabash & Missouri Pacific and other extensive Gould systems. We have not yet perfected the details of our extension, but will complete them very quickly."

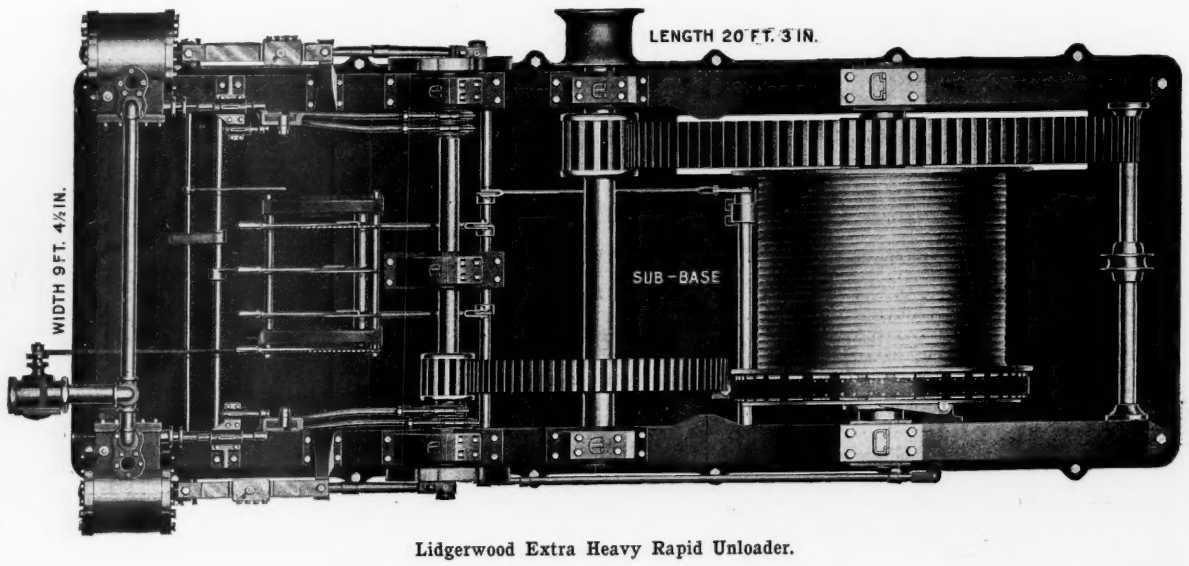
An Economical Method of Handling Dirt and Ballast.

BY SPENCER MILLER, C. E.

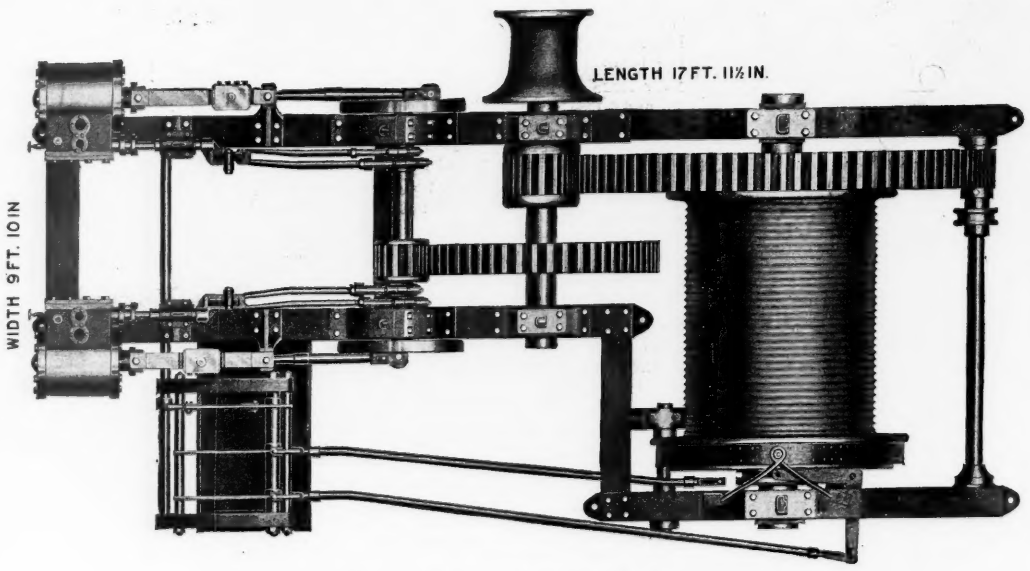
Having recently been collecting some data respecting the handling of dirt and ballast by the Rapid Unloader method, I have found some facts which I believe will be of interest to railroad men in general.

It was 10 years ago that, at the instance of Drake & Stratton, a special winding engine was constructed, mounted on a flat car and used to pull a plow along a train loaded with frozen clay. This is discharged with such despatch as to be given the name of "Rapid Unloader." Over 100 machines of the same size have since been put into use. This engine pulled over 25 tons on the plow line.

So long as the cars carried from 15 to 20 yards each, this size machine was found ample for all requirements. But for cars loaded with from 40 to 45 cu. yds., the necessity for a heavier machine became apparent. Such a one has now been produced. The accompanying cuts are plan views of the two Rapid Unloaders, and the following table of proportions indicates the difference in the strength of various parts of the two machines.



Lidgerwood Extra Heavy Rapid Unloader.



Lidgerwood Standard Rapid Unloader.

Comparison of Important Dimensions.

Standard Unloader, 25-ton pull.		Heavy Unloader, 60-ton pull.	
Size, 10 x 12.		Size, 12 x 12.	
Steam cylinder	10 x 12	Steam cylinder	12 x 12
Diameter drum	41 in.	Diameter drum	54 in.
Diameter drum shaft	8½ in.	Diameter drum shaft	10 in.
Face drum	49 in.	Face drum	42 in.
Grooved for rope diameter,	1¼ in.	Grooved for rope diameter.	1½ in.
Diameter large gear, cast iron,	89 in.	Diameter large gear (steel),	109 in.
Pitch large gear	3½ in.	Pitch large gear	3½ in.
Face large gear	8	Face large gear	10 in.
Proportion of gear	30.3 to 1	Proportion of gear	40 to 1
Width over all	9 ft. 10 in.	Width over all	9 ft. 4 in.
Length over all,	17 ft. 11½ in.	Length over all	20 ft. 3 in.
Weight	25,280	Weight	40,950
		Weight sub-base	10,580

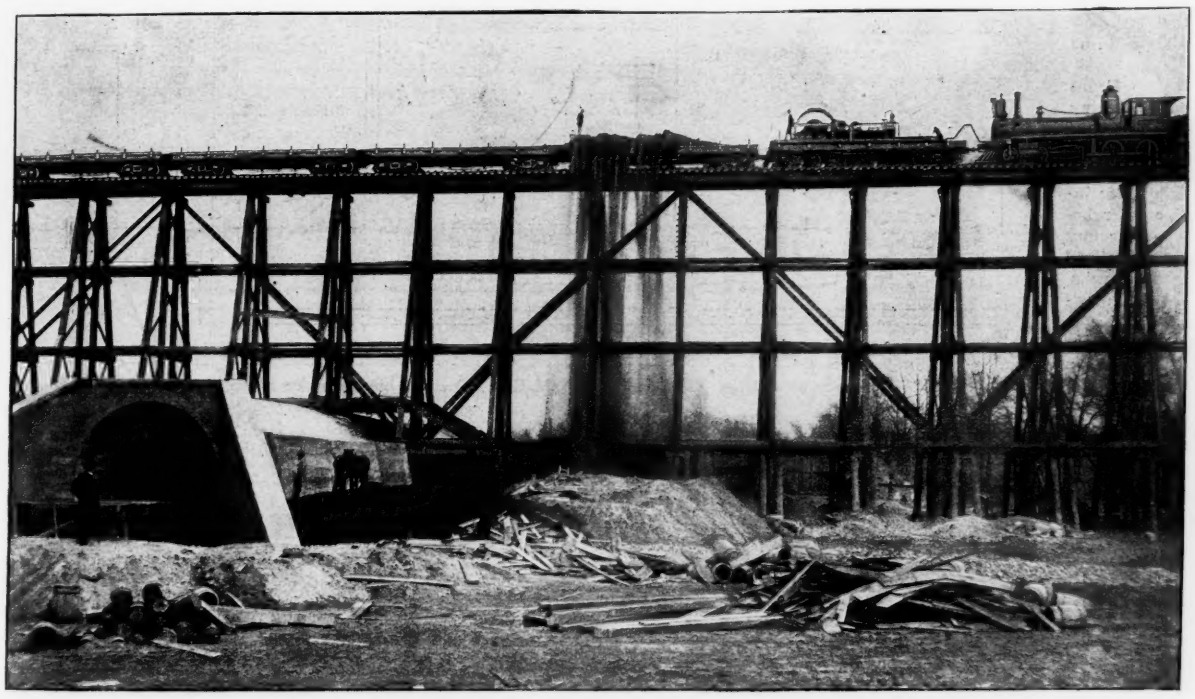
A large number of flat cars have been built to carry from 40 to 45 cu. yds. These are 40 ft. long and 8 ft. 9 in. between the stakes; side boards are provided 36 in. high, containing outswinging doors locked in position by levers. Steel aprons are hinged to one end of each car, so that a train of these cars becomes practically a con-

tinuous trough, favorably adapted to filling by steam shovels.

Mr. James J. Hill, President of the Great Northern Railroad, has filled cars of this sort with 41,700 yds. in nine days, or 4,563 cu. yds. a day. On the Port Arthur Route similar cars have been filled at the rate of 4,000 cu. yds. a day. These cars are only 7 ft. 1 in. above the rail, and the material is delivered almost continuously—conditions most favorable for a minimum cost in filling. Such cars should also permit a minimum cost in transportation, for we find them carrying 80 per cent. of live load. A train made up of 16 loaded cars, a rapid unloader car and a plow car will weight about 2,760,000 lbs., and is a pretty good load for the average locomotive. The train empty will weigh about 600,000 lbs., and the live load left along the track will be 2,160,000 lbs.

In contrast to this, suppose a dumping car train be composed of cars each having a carrying capacity of 80,000 lbs. and weighing empty 48,000 lbs. Twenty-two such cars will represent a total weight of 2,816,000 lbs., which is a little in excess of the rapid unloader train, and its live load will only be 1,760,000 lbs., or about 20 per cent. less than from the rapid unloader train, while the cost of these 22 cars will probably be double that of the unloader train. And to carry the same amount of dirt 27 cars would have to be provided.

The cost of discharging a load with the Rapid Unloader is not easily separated from the cost of running the train. In fact, when one railroad contractor was asked what the cost of discharging was, he answered that it was too small to be found; but the combined cost of transportation and unloading has been given at 1.36 cents per cubic yard for five months' actual work. The



Filling a Trestle on the Nashville, Chattanooga & St. Louis Railway.

capacity delivered by these trains is so large, and the cost of discharging is so small, that when the latter is divided by the former it brings the cost per cubic yard down to a small fraction of a cent. I have endeavored to obtain some actual figures of the cost of handling dirt from pit to track, and have written to some 300 railroad officials with this purpose in view. Many replies were received; but few figures given, arising from the fact that the work was carried on so intermittently that it was impossible to know what the cost was.

Mr. James J. Hill, of the Great Northern, has stated that he has handled dirt from pit to track for less than four cents per cubic yard. He employed a heavy steam shovel, cars with 36-in. side boards and the Lidgerwood Rapid Unloaders. Taking his record of 4,000 cu. yds. as the capacity of the steam shovel, it is wholly likely that he was able to pay all operating expenses inside this figure. It will be observed that 4,000 cu. yds. of earth at four cents per cubic yard will amount to $160 a day, which should certainly cover all the cost of operating one steam shovel and two rapid unloader trains, leaving considerable margin for repairs, etc.

The Kansas City Southern (The Port Arthur Route) kept careful account of all expenses for the months of March, April, May, June and July, 1900, and in that period 275,353 cu. yds. of dirt were handled at a total average cost of 0.0425 cents per cubic yard. This included dirt out on the road and leveling down, or 0.0289 cents per cubic yard loaded on cars at the pit, 0.0136 cents for hauling and unloading on the work and leveling down 0.0549 for putting same under the track, making a total cost of 0.0974 cents under the track. These figures cover all cost. Much of the work was in bad material, hauling from 5 to 50 miles and dumping with the Rapid Unloader. This work was done by use of the small size of Rapid Unloader, which needed frequent repairs in attempting to discharge 40 to 45 cu. yds. to the car, thus adding materially to the cost. Considering the difficulties encountered, this record is certainly remarkable.

A photograph is reproduced which shows a rapid unloader train delivering its entire load in a space of 50 ft. This was done in filling a trestle on the Nashville, Chattanooga & St. Louis Railway, near Paris, Tenn.; 210,000 cu. yds. are required to fill this trestle, which is 1,300 ft. long. The dumping is accomplished by moving the train in one direction as the Rapid Unloader pulls the plow in the opposite direction.

The opposite of this is resorted to in ballasting. On the Minneapolis & St. Louis Railway a load of gravel is deposited along a stretch of track three times as long as the train.

Concerning the Present Status of Steam Engineering.

A short review of the development of mechanical engineering during the past century, with especial note of the work of the year 1900 lately appeared in *The Engineer*, London. A few extracts from the article follow:

Great as the progress has been during the century, it must not be forgotten that certain things remain very much as they were. James Watt knew absolutely nothing of the science of thermodynamics as now understood; yet it is impossible to make any advance on the principles of construction which he laid down. If we add to his work that of Hornblower, who invented the compound engine, we may say at once that no advance whatever has taken place in the working of steam engines. Superior materials and workmanship enable us to use steam of a pressure that would have terrified Watt. But the normal counsel of perfection is still the same—expand steam in a hot cylinder. If, again, we turn to the explosive engine, it will be found that it has been developed without much regard for thermodynamics; and that for its success it mainly depends on the observance of certain principles of construction which have been discovered by practice with the engine, and not by mathematical investigations. Not the least instructive lesson taught by the events of the last century is that we have mainly reached our present position by trial and error, and that little or nothing has originated by the aid of mathematical science. The original thinker, who has been able to reduce his thoughts to practice, has done the world's work. The bookman has followed afterward and explained why it was that the doer had succeeded.

In every country save Great Britain the compound system [for locomotives] is being adopted, and that at once so completely and so entirely that it is not too much to say that in a few years a non-compound locomotive will have become as rare as a non-compound marine engine. Yet now Mr. Webb's engines on the London & North Western are the only compound locomotives in use in this country. The compound locomotive has been tried on our railways, and, it would appear, has not done what was expected. It is rumored, indeed, that engines of the Chemin de Fer du Nord type, whose magnificent performances have been chronicled in our pages, are to be tried on one of our northern railways.

It remains to be said that, for some wholly unexplained reason, it seems that rolling stock in this country runs with a greater resistance than it does either in the United States or on the Continent. The facts want investigation. Before leaving the subject of locomotives, we may say that the American engines which have been used in this country have not given satisfaction; and the American heavy wagons, the use of which has been so ardently urged on railway men here, are beginning to give trouble.

In marine engine work the world appears to have got very near finality. The difference in designs of various firms is infinitesimal. All marine engines are vertical. They are all of nearly the same pattern and proportions. The exceptions are few. Among them we mention the five crank engines of the late Mr. Thomas Mudd, which are being successfully worked with steam of 250-pound pressure made in Scotch boilers. Mr. Howden's system has at last, by its intrinsic merits, forced its way into favor, and during the last year over 500,000 h.p. of boilers were fitted by his firm. A prominent feature in the year's work has been the increased business with foreign shipbuilding and engineering firms; among the steamers built abroad fitted with this system being "La Lorraine" and "La Savoie" and the great steamer "Deutschland," the highest powered steamer in the world.

Concerning water-tube boilers, we prefer to say nothing more for the present than that both the Yarrow and the Thorneycroft boilers are being largely used for ships of considerable size. Until the committee which was appointed last year to investigate boiler engineering in the navy has concluded its labors and published its report, it is, we think, better that as little as possible should be said on the subject.

Before leaving marine propulsion it is right to refer to the success attained by Mr. Parsons with the steam turbine. With it the highest speed has been reached ever imparted to a floating body, and the expenditure of steam has not been excessive. With steam turbines of considerable power an electrical horse-power has been attained, it is stated, for about 18 lbs. of steam per hour—a very good efficiency indeed.

A most remarkable advance in steam economy appears to have been effected by using steam on the Schmidt system. This has passed the experimental stage, for engines of over 87,000 h.p. are at work. In one installation representing 7,000 indicated horse-power, steam of 150 lbs. pressure, with a temperature of 358 deg. Fah., is superheated to about 620 deg. Fah. The consumption of steam is said not to be more than 10 or 11 lbs. per i.h.p. per hour. In the Schmidt engine the superheater is arranged behind the boiler, and consists of a series of zigzag coils welded together in long lengths with the joints outside the brickwork, so that contact between them and the flue gases is avoided. The superheated steam from the boiler is admitted at the top of the superheater and flows downward through one-half of the coils in the opposite direction to the flue gases. It is then led to the bottom coils of the superheater and arrives there in a perfectly dry condition but not superheated. The dry steam then travels in the same direction as the gases, being led from the superheater at about the middle of the coils. By this arrangement the coils nearest to the gases having the highest temperature are cooled inside by the steam, and are thus prevented from becoming too highly heated. This is practically the only method by which deterioration of the coils can be prevented for any length of time, while in addition the whole heat of the gases is utilized in as economical a manner as possible. The flue-fired superheater thus forms a part of the boiler, and is heated with a portion of the boiler-flue gases. It is therefore always ready, and comes into operation whenever the boiler with which it is connected is fired.

The normal type is a single-acting engine, with two horizontal cylinders, lying side by side, the pistons of which work on cranks 180 degrees apart. The pistons are long trunks without piston rods or stuffing boxes, and the piston rings are placed well forward out of the way of the hot steam. A plain piston valve without spring rings gives admission of steam to each cylinder alternately, and another similar piston valve controls the exhaust from both cylinders. The engine has no stuffing boxes, the valves being worked so as to dispense with valve rods. The piston valves are accurately turned to fit a cast-iron bush containing the ports. The engine has a shaft governor which controls the cut-off by acting on the eccentric of the admission valve.

An oil pump with a ratchet feed is used to supply a definite quantity of "valvoline" as lubricant to the valve chest and cylinder at each stroke. It is beyond question that engines of all kinds worked with superheated steam depend mainly for durability on the use of mineral oil as a lubricant. With it what was impossible in the earlier portion of the century has been made quite practicable. In various directions attention is being directed to superheating.

Consul-General Guenther, of Frankfort, reports that a masonry arch is being constructed across the valley

of Petruffe, in Luxembourg, which will have the largest single span of any masonry bridge, viz., 277 ft. The largest masonry span now is Cabin John Bridge, Washington, viz., 220 ft.

The Barschall Joint.

We have just received a copy of an important letter concerning the Barschall joint, a translation of which is below. It is from the Director of the Mecklenburg Friedrich-Franz Railroad (648 miles), Mr. Piernay, and is dated Schwerin, March 26, 1901.

"Replying to your inquiry of Sept. 6, 1900, we beg to report that the 5,000 'Stossfangschienen' (Barschall rail joints) were placed in the main track during the fall of 1898 and June, 1900, between the stations Schönberg, Grevesmühlen and Plüschow, so that we now have a stretch of about 19 kilometers equipped with these joints.

"Owing to the comparatively short time of service, it is, of course, not possible to pass final judgment on the efficiency of these joints, but we gladly state that the track so equipped rides much more easily and pleasantly than the adjoining stretch equipped with angle bars.

"With longer service, defects may appear to change our present opinion, but, judging from our experience to date, we can certify that by the use of these joints rails with hammered or bent ends, but otherwise still serviceable, will do for still longer service.

"To your further inquiry regarding the cost of maintenance with these joints as compared to the cost with other joints, would state that by the adoption of the Barschall Rail Joint we find an annual saving in the cost of maintenance of about 40 marks per kilometer.

"Though these savings in cost of maintenance cannot as yet be taken as a positively fixed amount, we feel that your question, whether by the use of the Barschall Rail Joint the cost of maintenance is reduced, should be answered affirmatively."

As the reader probably knows very well, the Pennsylvania Lines West of Pittsburgh have in something like 25 miles of the Barschall joint, which has been in service now two years or more, and as we have described the joint repeatedly, its construction must be quite familiar. It is in three pieces—an angle splice inside, a section of carrying rail outside and a filler between the carrying rail and running rail. The overhang of the tread of the wheel runs on the carrying rail at the joint, thus relieving the ends of the running rails. So far as we can learn, the experience on the Pennsylvania Lines has been satisfactory, but the price is greater than the ordinary angle splice joint. Obviously, any probable difference in price would be offset by a small difference in the cost of maintenance, but Mr. Barschall has brought forward many figures, some of which we have printed from time to time in these pages, showing a great saving in maintenance of track and of rail by the use of his joint. One point worth considering has come up recently. At the discussions at the convention of the American Railway Engineering and Maintenance of Way Association one objection to the use of 60-ft. rails or longer was the difficulty of providing for expansion. With a joint of the Barschall type this difficulty no longer exists, and therefore 60-ft. rails may be used, thus doing away with half the joints. Consequently, setting aside entirely the saving in cost of maintenance, there would still be an economy if the Barschall joint cost anything less than twice as much as a joint which necessitated the continued use of 30-ft. rails.

Steam Boiler Efficiency.*

BY WILLIAM KENT.

In designing a new steam boiler plant the first consideration is the quality of the coal that is available. When there are several different kinds that may be used, it will usually be found that the coal of the poorest quality is relatively undervalued in the market, and is therefore the cheapest to use, provided the furnaces are suitable for burning it. The size and kind of furnace required for a given horse-power depend upon the quality of coal. The furnace should, therefore, be designed to suit the coal.

If the coal is bituminous the furnace should be designed so that it will consume the smoke. This is not difficult. There are several kinds of furnace that will accomplish it. Whether automatic stokers should be used or not will depend upon the size of the plant. If the plant is over 1,000 h.p. it will generally pay to use them. In large plants also it will pay to install overhead coal storage bins and mechanical appliances for elevating and storing the coal, which is then fed by gravity through tubes into the hoppers of the stokers.

The furnaces should be designed of such a capacity that they will burn the maximum quantity of coal that will be needed to make the steam, when the steam demand is the greatest, when the coal is of the poorest quality that is likely to be used, and when the atmospheric conditions are the most unfavorable. The capacity of a boiler for producing steam is limited by the capacity of the furnace for burning coal, and this capacity depends upon the quality of the coal and upon the draft.

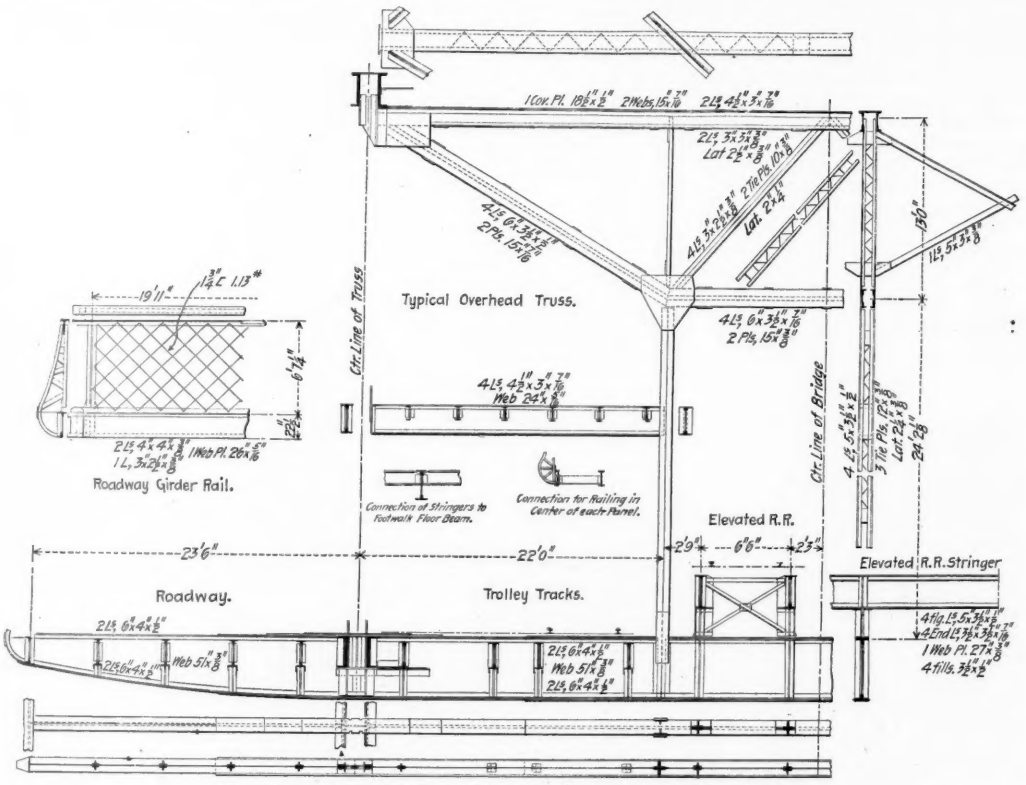
Having settled upon the style of furnace and upon the area of grate surface required to burn the coal, the boiler itself is next to be considered. The area of heating surface to be furnished for a given power will depend upon the degree of economy which it will pay to secure. In order to have a boiler efficiency of from 70 to 75 per cent., the furnace being designed so as to affect complete combustion, it will be necessary to provide 1 sq. ft. of heating surface for every three pounds of water to be evaporated per hour. If less than this amount of heating surface is provided, the economy will be diminished. How much the economy will be decreased with rates of driving more rapid than three pounds of water per hour per square foot of heating surface is quite a complex problem. It may be solved mathematically by an equation containing not less than five variables. The most important of these is the air supply per pound of fuel. Next in importance are quality of coal and thoroughness of combustion and design of gas passages so as to avoid as much as possible the short circuiting of the gases. Of lesser importance are the loss by radiation and the pressure of the steam.

The amount of air supply being the factor of greatest importance in the efficiency of a boiler, and it being impossible for the fireman to determine by the ordinary means of observation whether the air supply is what it should be, it is highly desirable that some means be provided to assist in determining it. One of these is an apparatus for continuous indication of the amount of carbonic acid or of free oxygen in the chimney gases. Another is a recording furnace pyrometer. The maximum possible furnace temperature is the condition upon which depends maximum economy, and this corresponds with an air supply of about 20 lbs. of air per pound of carbon when the fuel is anthracite or a high grade of bituminous, and a somewhat smaller supply when the fuel is low grade bituminous or lignite.

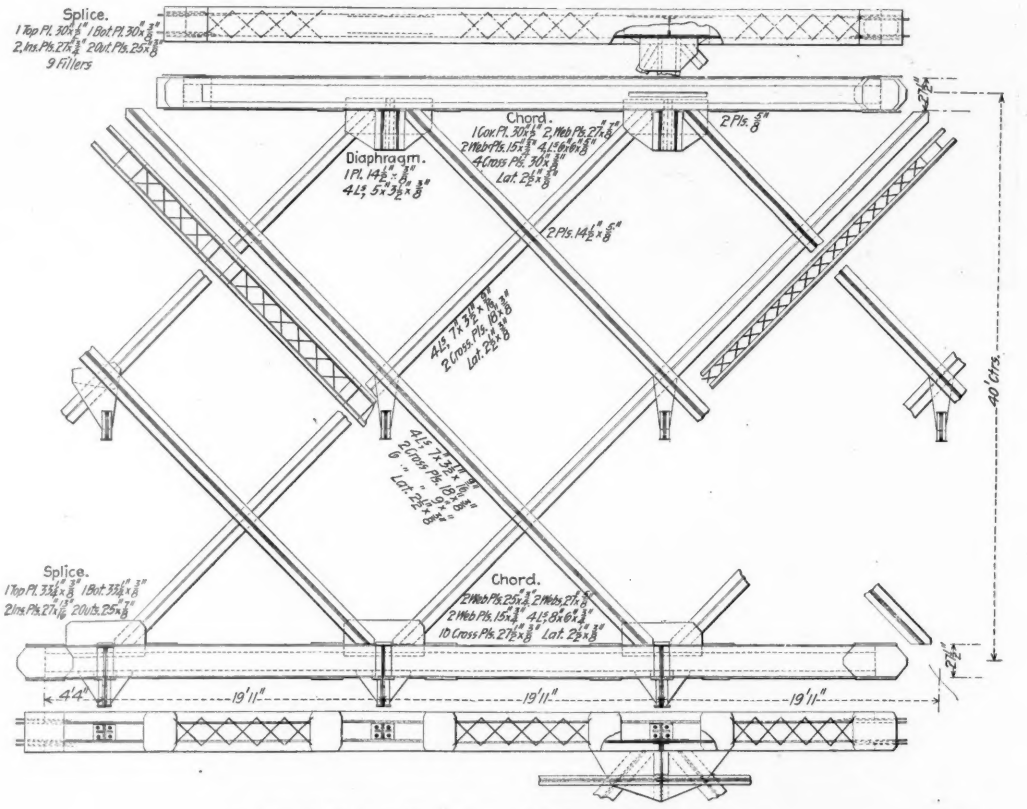
*Abstract of a lecture delivered April 10, 1901, before the Engineering College, University of Illinois. The lecture was illustrated by lantern slides made chiefly from the illustrations in the lecturer's new book on "Steam Boiler Economy."

The Suspended Structure of the New East River Bridge.

Last week we described briefly (page 250) the suspended structure of the New East River Bridge, bids for which will be opened April 25, and now we give a few characteristic drawings of the main span truss, selected from 25 sheets which accompany the specifications. This suspended structure is 1,600 ft. It begins at panel point 29 on the land side of the tower, and panel point 30 shown in the drawing of the cantilever end of the main span truss is at the center of the tower. The cantilever end supports one end of the approach span. The main continuous stiffening trusses are supported on rocker arms on the main towers and on the main floor beams. This arrangement is shown in one of the engravings. Many details appear in the engravings; generally the rivets are ⅞ in. The general dimensions of the bridge are as below:

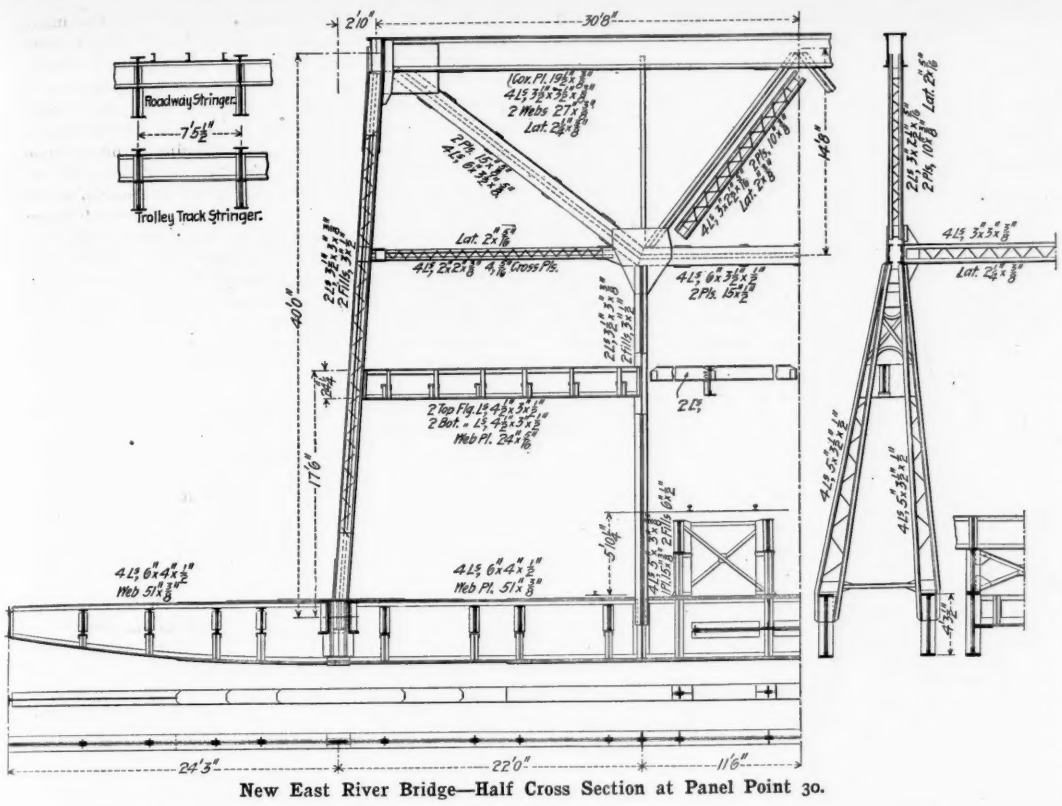


New East River Bridge—Half Cross Section at Panel Point 34.

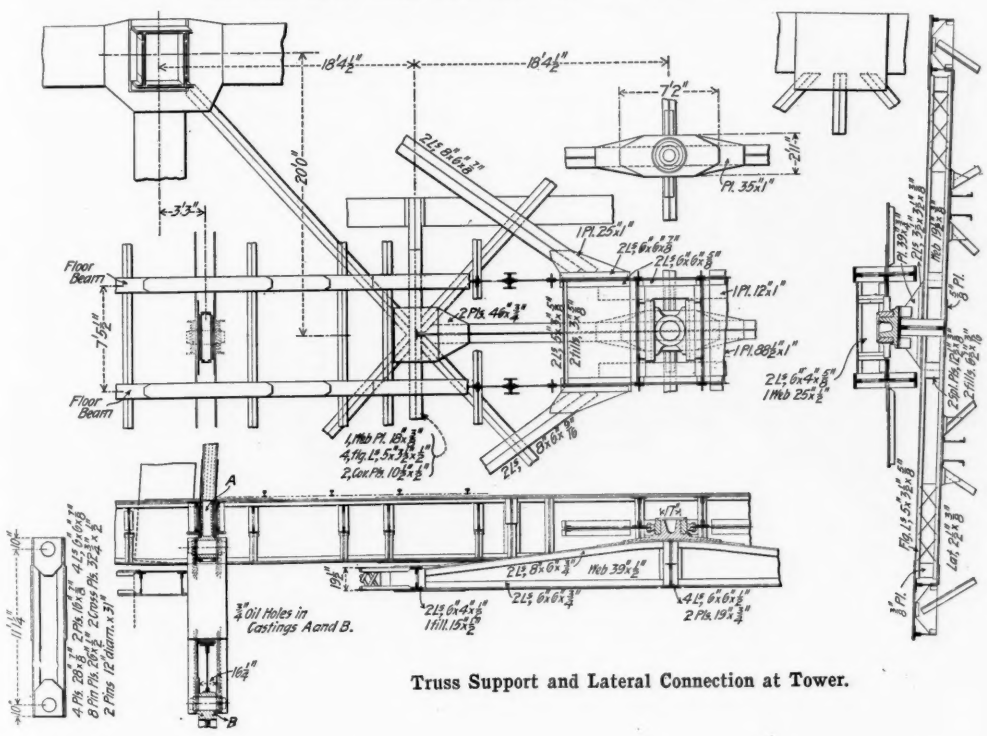


New East River Bridge—Suspended Span; Panels 32 to 35.

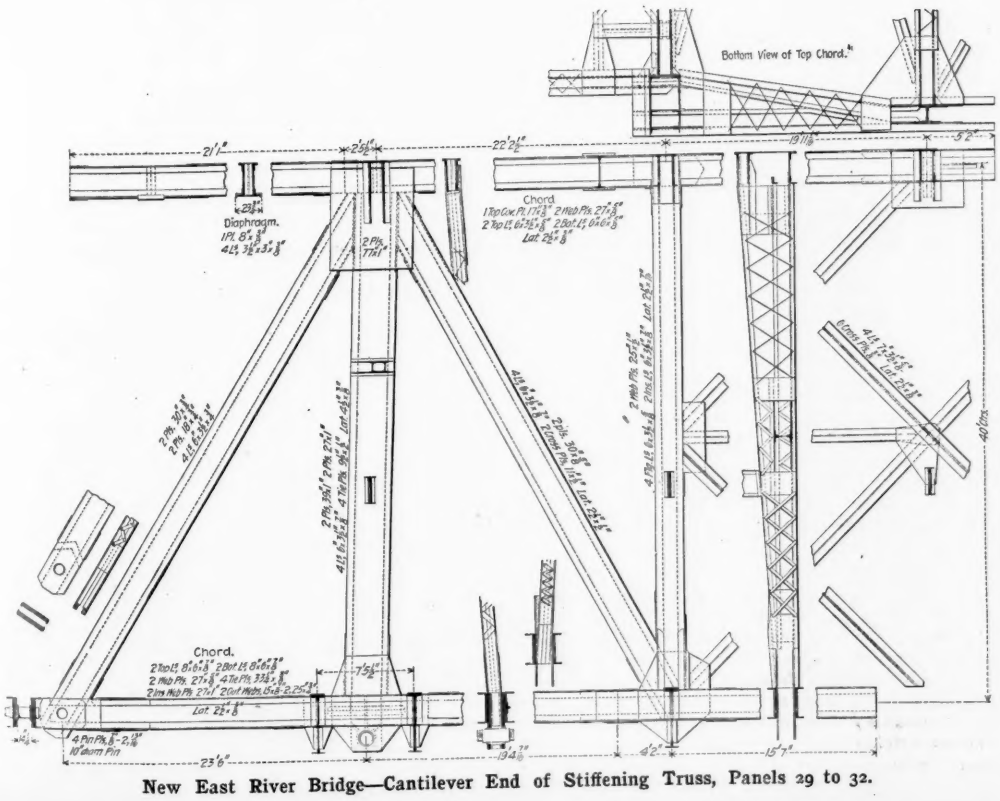
Length of main span, cen. to cen. of towers	1,600 ft.
Length of entire bridge between terminals	7,200 ft.
Width of bridge main span, over all	118 ft.
Min. height of bridge above M. H. W. of spring tides at pier-head lines	117 ft.
Min. height of bridge above M. H. W. of spring tides for 200 ft. each side of center of main span	135 ft.



New East River Bridge—Half Cross Section at Panel Point 30.



Truss Support and Lateral Connection at Tower.



New East River Bridge—Cantilever End of Stiffening Truss, Panels 29 to 32.

Height of masonry of tower found above H. W..	23 ft.
Height of Cen. of cables at top of towers above H. W.	335 ft.
Width of each carriage way	18 ft.
Width of 4 trolley car tracks, cen. to cen., each.	9¼ ft.
Width of 2 elevated R. R. tracks, cen. to cen..	11 ft.
Width of 2 footwalks, each	12 ft.
Width of 2 bicycle paths, each	7 ft.
Two stiffening trusses, cen. to cen	67 ft.

Other details will be found in the description printed last week. Mr. L. L. Buck is Chief Engineer and Mr. O. F. Nichols is Principal Assistant Engineer.

Specifications for Steel Axles.

The specifications for steel axles, as proposed by the American Section of the International Association for Testing Materials were first made public in the *Railroad Gazette* June 1, 1900, at which time we printed also elaborate tables giving the specifications and practice of various railroads. Therefore, we need not reprint the specifications now, especially as we shall probably have occasion to do so, but we give below extracts from a discussion on this subject held at the Western Railway Club in March.

Mr. M. H. Wickhorst (Engineer of Tests, C. B. & Q.)—Clause No. 1.—This clause reads: "Steel for axles shall be made by the open hearth process." This is intended to cut out steel made by the Bessemer process, as not being even enough in quality for axles. If the axles are well inspected and tested, it would probably be well to leave out any mention of process of manufacture, as this might otherwise shut off development of processes other than the one specified. If inspection and tests are not made, it would then seem well and proper to specify process of manufacture.

Clause No. 2.—This clause limits both phosphorus and sulphur to .06 per cent. This seems reasonable for both manufacturer and consumer. Carbon is not specified. The minimum limit for carbon, in various specifications, varies from .20 per cent. to .35 per cent., most of them being .35 per cent. The maximum limit varies from .35 per cent. to .50 per cent., most of them being .50 per cent. The principle involved in deciding upon the carbon desired is this, namely, the higher the carbon, the stiffer is the axle, and the greater stress will it stand without taking a permanent set. The carbon should be as high as experience shows to be safe; if it is too high the axle may break off under excessive shocks, greater care is necessary in the manufacture to insure satisfactory material, and then, too, hot boxes with water cooling are more apt to cause cracks and injury to the material. On the other hand, if the carbon is too low, the metal may not be strong enough and fail by detail fracture. That is, a small crack may start, due to the material not being stiff enough, which gradually increases till final fracture is the result. Most of the axle failures which I have seen come in the latter class. I do not now remember seeing one of the former class. It would seem well to me to specify carbon. I would suggest the usual limits, namely, .35 per cent. minimum and .50 per cent. maximum, and go above these limits rather than below.

Clause No. 5.—The physical test for car axles consists of an impact or drop test. This test is made in preference to a tensile test of a specimen taken from an axle, because it is a simpler test to make, and then, too, to carry out the principle of testing a whole sample of the finished product, where practicable. A limit is placed on deflection under the first blow, to avoid getting material too soft and yielding. One axle is selected from each melt. The drop machine prescribed is one originally used by the Pennsylvania Railroad, and has now been adopted by the Master Car Builders' Association as its recommended practice. The essential parts of the machine are a hammer weighing 1,640 lbs., an anvil supported by springs weighing 17,500 lbs., and axle supports 3 ft. apart. The drop machine, prescribed in specifications we are considering, seems to be the only one having any claims to be considered a standard machine.

Clause No. 11 states that drillings taken midway between the center and outside, or drillings from a sample test ingot, if preferred by the inspector, shall be used to determine whether the melt is within the limits of chemical composition specified in paragraph No. 2. The inspector representing the consumer, should always take the sample from any steel product from a portion of the finished material wherever possible. The most important thing to look after in inspecting steel axles is to insure that no crop ends of ingots have been used, and that no seriously segregated material gets into the axle. For this reason I do not think it proper to let the axles pass upon the heat analysis, but analysis should be made of borings taken from the end of the finished axle, so there may be some chance of getting hold of badly segregated axles, if there be any. The chances and temptations of not discarding sufficiently from the top of the ingot are so great in this case that I lay all the more stress on it.

To show how serious the segregation may be, I give a sketch (Fig. 1 on next page) showing an axle which failed in service, and which was made from the piped end of an ingot. It will be noted that the failure consisted of the axle breaking at the junction of the journal and the wheel fit, and the journal in coming off took along with it a tapered oblong portion extending into the axle about 12 in. The journal and this tapered piece consisted of the piped material from the upper end of the ingot, and etchings of sections from different portions of the axle showed this piped material

to run all the way through the axle, being, however, at the end opposite the break, only a small portion in the center.

The analysis of broken axle gave the following results from borings taken from a section of the body of the axle just away from the end of the tapered portion which broke off, the borings having been taken from the center, and also close to the outside.

	Outside.	Center.
Carbon	.09	.10
Phosphorus	.068	.226
Sulphur	.047	.120
Manganese	.40	.53

While on this subject of driving axles, I wish to make a few remarks concerning the design of these axles. Driving axles and engine truck axles are frequently designed so that the wheel fit is of the same diameter as the body of the axle, or even less in diameter. In an axle the stresses in the metal are greatest where the axle enters the wheel, diminishing toward the center of the axle and also toward the end, if the journal is outside of the wheel. For this reason the wheel fit should always have the greatest diameter of any part of the axle. Where the wheel fit is not larger in diameter, the effect is to localize strains at the junction of the wheel fit and body of the axle, causing small crack to start with, which keeps enlarging and finally results in failure. I have seen a number of failures where improper design was the cause.

Professor W. K. Hatt (Purdue University).—The problem to solve has been to standardize the impact test for axles so that the results shall be predicted on constant conditions of operation. The machine with heavy anvil and spring foundation has solved this problem in so far as we desire to obtain fairly comparative results on identical material at different localities. It somewhat favors a hard axle as against a soft axle.

Two matters have received no attention: (1) Some specifications should be made regarding the interval of time between the blows, and (2) some restrictions should be placed on the temperature at which these tests are made.

(1) Since the distortion of the first blow hardens the metal and destroys its elastic properties, and subsequent molecular changes are experienced which require time for their full effect, it would be well to specify that the test should be uninterrupted. Likewise, the influence of

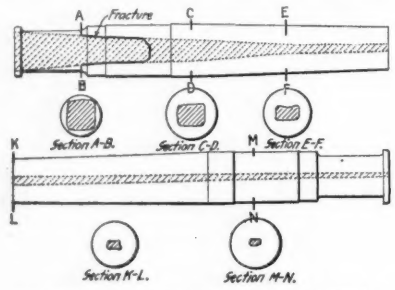


Fig. 1.—Failure of an Axle from a Piped Ingot.

the heat (which is developed due to the friction of the material while bending) on the mechanical properties of the material also renders it advisable to specify an uninterrupted test in order to insure similar temperatures of the axles during the application of the later blows.

(2) With regard to the atmospheric temperature, the writer is not of those who would specify this too closely. As far as he can judge from his own tests and from a review of those of others, the ordinary variation of temperature from 32 degrees F. to 100 degrees F. will have little effect on the ability of soft steel or nickel steel to resist heavy blows. There is, however, at 0 degrees F. a marked diminution of resistance to shock, both as indexed by the capacity for absorbing work and by ductility. A specification should limit the tests to atmospheric temperature between 32 degrees F. and 100 degrees F., although an experimental examination directed to this specific end might show these limits to be too wide.

Section 10.—Yield Point.—The writer feels that the yield point should be obtained from some simple apparatus which would evidence the sudden increase of elongation, rather than from the time-honored "drop" of the scale beam.

Finally, it should be noted that the test does not reproduce the conditions of service, in which a blow does not strike the center of the axle as in the method of test. In service the center of the axle is subjected to a combination of the ordinary repetitive stresses due to rotation, and those arising when blows are transferred from the hub to be taken up by the yielding center; so that the test leaves something to be desired in the way of similarity to the service conditions experienced by the axle.

Mr. E. D. Nelson, Superintendent of Motive Power, Northern Central Railway.—I notice that the amount of carbon allowed is not given in the specifications as proposed, although on page 4 the conclusion is that the chemical composition should specify the amount of carbon, and that the limits should be .35 to .50 per cent. It is especially gratifying to note that Mr. Wickhorst's feeling is that the upper limit should be exceeded rather than decreased. These limits are now those provided by the M. C. B. Association in their specifications for steel axles, and are the same as have been used by the Pennsylvania Railroad for a number of years, and we have had exceedingly good results from axles made with these limits of carbon. At the same time, our feeling is that any change should be in the direction of higher carbon rather than lower.

As to the question of injury to axles through water being put on hot journals as affecting the amount of carbon, we have bought on the Pennsylvania Railroad a great many thousand axles on these specifications in the last five or six years, and while I have followed this matter rather closely, I have not learned of a single case of a broken journal that could not be traced to segregation. I think there have been only two broken journals from this cause, and none from detailed breaking. This seems to point favorably in the direction of the present limits of carbon.

It is important that axles should be made to conform to the dimensions which have been adopted. This cannot well be done if axles are simply smooth forged. It can, however, be done by having axles rough turned all over, and, as far as I have been able to ascertain, none of the axle makers object at all to doing this work; in fact, they see some advantage to themselves in doing it.

I notice provision is made for stamping the melt number and initial of the maker on each axle, and would call your attention to the rough collar provided in the later M. C. B. design of axles, on which it was proposed to put such markings as might be necessary. I recently noticed specifications prepared by a railroad company, in which it was specified that the marking should be done in the center of the axle. I think that it is important to have this matter understood, as any indentation due to marking in the body of the axle is undesirable as making a likely point at which cracks may start.

Mr. S. M. Vauclain.—The specifications for steel axles are open to criticism, because they attempt to cover in one specification two classes of material, which in the matter of test requirements have absolutely nothing in common. This is the first time any attempt has been made to group car and other truck axles with driving axles, and in this respect makes a cumbersome specification and an inconvenient one to use. The matter could be simplified very much by omitting all reference to driving axles in this specification, and covering the latter in another specification specially drawn up for locomotive driving axles, rods, pins and guides.

The specifications for truck axles are representative of American practice, and fair to both parties of the contract, but the International Association for Testing Material has disregarded the wishes of the great majority of railroad companies, as indicated by their present specifications in framing the specifications for forgings. They have subdivided the specifications for plates into three separate classes, namely, boiler plate, bridge material and building material, but their forgings specification covers a multitude of grades, and compels a purchaser to indicate in his contract the grade of steel he desires.

There is less variation in the desires of the various railroad companies in the matter of steel forgings than in any other class of material, and the records of the International Association for Testing Material show that the users of this class of material who, more than any other, purchase their material to specifications. These facts should have been recognized by giving the users of this class of material a distinct specification for locomotive forgings. Such a specification should cover driving axles, crank pins, rods and guides, and should be so explicit that there can be no question as to what is desired or what will be supplied. This is a prime necessity in an International specification, for when foreign orders are placed in America, there is no time for the contractor to skirmish around for six months trying to ascertain the grade that is desired to be used. There are many instances on record where it took a longer time to settle minor questions regarding specifications than it did to complete the order when the work was finally in hand.

For these reasons but one grade of material should be specified, and those that desire a special grade of steel will find plenty of opportunities for making a selection from among the nickel steels, oil tempered steels and special process steels covered in the general specifications for forgings.

The only objection that I have to the specification is the injunction of the driving axles specification in place of including it, as is customary, in a general locomotive forging specification.

Mr. W. H. Marshall (L. S. & M. S. Ry.).—It is very important for railroads to have uniform specifications. If uniformity came on a thoroughly good specification it might mean a higher grade of steel for all of us, because the manufacturers are now making a certain grade of steel that will satisfy some railroads, but will not make the higher grade of steel, because it is special, whereas, if we all demanded it they would come to our specifications. It would seem that a specification, to be complete, ought to insist on a certain portion of the ingot to be discarded.

Mr. F. W. Sargent (Sargent Company).—A point has come up in this discussion upon which I may throw a little light, and that is, the question of defects in castings and forgings due to shrinkage cavities. The amount to be cut off to insure sound forging depends upon the quality of the metal and the shape of the ingot. It seems very probable that the axle exhibited by Mr. Wickhorst was drawn out from an ingot which did not have the top removed, though how such a cavity could be filled, as in the case of this axle, is a difficult question. It looks as if the shrinkage cavity had been filled after the original ingot was made and then the axle forged. Some years ago Mr. Delano, while investigating the steel rail manufacture, had some etchings made representing equidistant sections of a rail from a complete ingot. Three out of the five rail sections showed flaws, due to the pipe in the ingot; the remaining two sections, representing the bottom of the ingot, were sound, so that on this basis three-fifths of the ingots should have been scrapped. In forging a piped ingot they close the cavities, but there is no welding of the walls of the cavities, and a flaw always remains, which may prove dangerous. The inspector of steel forgings should, if possible, investigate the billets from which the forgings are made, rather than endeavor to find the defects in the finished piece, although I have no doubt that many laminated steel axles would be readily discovered by very slightly etching the ends of the axle, which would show up the structure very clearly.

Mr. Charles Riddell (Standard Steel Works).—The Standard Steel Works have for a number of years past been casting their tire ingots about 5½ ft. long and of diameters varying from 10 to 18 in. From the tops of these ingots at least 25 per cent. is discarded, and after nine years' experience with this method of handling tire ingots it can be said that it results in practically eliminating the liability to breakages of tires, as it thoroughly guards against the introduction of piping or blow holes and segregations in the steel being worked into the tire.

Mr. Bush.—I do not think it is fair for the consumer to take the position that he is going to tell the manufacturer what he wants and then tell him how to make it. I think it is only fair that the manufacturer should have at least a little latitude in getting results. Let us tell him what we want, and let him, with his ingenuity, strive to attain those results; let him have the benefit of his ingenuity. I think the remarks Mr. Marshall made are very good, too, in regard to uniformity of specifications for railroads. It seems to me that this is one of the most important things we can accomplish.

Mr. Wickhorst.—As regards specifying the method of manufacture, that is quite a big subject to inspectors especially. As representing a large consumer of material, my position is about this: I say to the manufacturer, By all means I submit that you know a great deal more about how to make the things than I do, but when it comes to the use of them, or what service they give, I watch how the material acts after I get it, and I think it my place to know best what shall be the properties of the materials used.

As regards how serious such failures are as the one exhibited, due to crop end, well, I cannot say that I have seen another one just like that; it is one of the worst. The Burlington road has not used a great many steel axles, so that naturally we have not had a great many failures; but I heard Dr. Dudley, of the Pennsylvania, recite a case where they had got a lot of steel axles and put them into some new cars, and before one of the cars had got out of the yard an axle broke, and another car made something less than a hundred miles when an axle broke; they had two or three cases following right after that. When they traced the matter up they found the manufacturer was short of good billets, and he had used some of these crop ends. That probably might come under the head of accident instead of something that was to be expected; but I would call particular attention in the specifications that the inspecting engineer should never take a heat analysis to represent the finished material, but always take the borings from the finished material, because if some of this kind of material gets into the lot he has some chance of finding it.

In regard to the amount of discard from the top, that is a matter I think I would be willing to leave to the manufacturer. Of course, different ingots are not the same. Some probably will be sound pretty near all the way through, and others, perhaps, you would want to discard 100 per cent.; so you have those two extremes, and it is a matter of experience and test, very largely, to find out just what is the proper amount to discard. As an inspector I would hardly care to specify how much should be discarded, because ordinarily I have no way of telling at all how much had been discarded.

The Andrew Carnegie Research Scholarship.

We recently mentioned the fact that Mr. Carnegie had put in the hands of the British Iron & Steel Institute a fund to establish a research scholarship. The official circular from the Secretary of the Institute announcing and explaining this matter is now received, and below it will be found printed in full.

"A research scholarship or scholarships, of such value as may appear expedient to the Council of the Iron & Steel Institute from time to time, founded by Mr. Andrew Carnegie (Vice-President), who has presented to the Iron & Steel Institute 32 $1,000 Pittsburgh, Bessemer & Lake Erie Railroad Company 5 per cent. debenture bonds for the purpose, will be awarded annually, irrespective of sex or nationality, on the recommendation of the Council of the Institute. Candidates, who must be under 35 years of age, must apply on a special form before the end of April to the Secretary of the Institute.

"The object of this scheme of scholarships is not to facilitate ordinary collegiate studies, but to enable students who have passed through a college curriculum or have been trained in industrial establishments, to conduct researches in the metallurgy of iron and steel and

allied subjects, with the view of aiding its advance or its application to industry. The National Physical Laboratory, on the governing body of which the Iron & Steel Institute is represented, would for many reasons be a very suitable place in which such a research could be carried out. There is, however, no restriction as to the place of research which may be selected, whether university, technical school, or works, provided it be properly equipped for the prosecution of metallurgical investigations.

"The appointment to a scholarship shall be for one year, but the Council may, at their discretion, renew the scholarship for a further period instead of proceeding to a new election. The results of the research shall be communicated to the Iron & Steel Institute in the form of a paper to be submitted to the annual general meeting of members, and if the Council consider the paper to be of sufficient merit, the Andrew Carnegie Gold Medal shall be awarded to its author. Should the paper in any year not be of sufficient merit, the Medal will not be awarded in that year."

Aldace F. Walker.

Mr. Aldace F. Walker, Chairman of the Board of Directors of the Atchison, Topeka & Santa Fe, died suddenly at his home in New York city on April 12, at the age of 59. Mr. Walker had been in poor health for three or four months, but he had attended to his business most of the time, and was preparing to go to Europe soon. His death was due to heart disease. He leaves a wife, two sons and one daughter. One of the sons, Roberts, is a lawyer in New York city, and the other, Harold, is a law student at Columbia University.

Mr. Walker was born at Rutland, Vt., and was graduated from Middlebury College in 1862. He at once enlisted in the Eleventh Vermont Volunteers, and rose to be Lieutenant Colonel. After the war he studied law at Columbia, and practiced in New York city for six years following 1867. He then went to Rutland, where he was counsel for many railroads and other corporations. He was a member of the Vermont Senate in 1882 and 1883. In 1887, on the enactment of the Interstate Commerce Law, he was appointed a member of the Interstate Commerce Commission, but after two years he resigned to become Chairman of the Interstate Commerce Railway Association, a new organization by which the railroads west of Chicago tried to suppress rate cutting and regulate traffic affairs in that troublous territory. This Association, like all others of the kind, proved inadequate to the purposes for which it was created, and Mr. Walker, in 1894, resigned to become one of the Receivers of the Atchison, Topeka & Santa Fe. After a successful administration of that property during the period of reorganization, he was elected Chairman of the Board of Directors of the reorganized company; and the duties of this office have constituted his main work since that time, though he was director in several other organizations, including the Central Vermont Railway.

Mr. Walker first came into prominence outside of Vermont when President Cleveland appointed him Interstate Commerce Commissioner. As one of the original members of that body he did important constructive work in defining the scope and meaning of the Interstate Commerce law. The manifest fairness of his decisions, with his known uprighteness of character, at once gave him a distinction second only to that of Chairman Cooley, who had attained national fame before the Commission was established. Mr. Walker's writings were always lucid and convincing, and the value of his work on the Commission consisted not only in those decisions wherein he did all that was possible to carry out the beneficent purposes of the framers of the new and experimental law, but to an equal extent, perhaps, in his views on those cases which only served to show the inadequacy of the law for some of its supposed purposes, and the impossibility, by either administrative or judicial processes, of carrying out the most cherished wishes of the friends of the law. Mr. Walker continued his useful work in this direction after he left the Commission, writing numerous magazine articles and putting forth many philosophical and instructive decisions in his capacity as chief officer of the Interstate Commerce Railway Association.

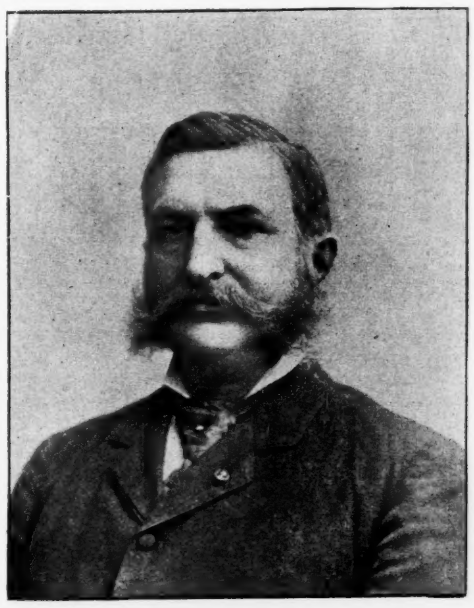
His leaving the Commission and going to this Association was indeed, we suppose, due to the conviction that he could do more useful work in the new place. The impossibility of doing a great public service on the Commission was early apparent to one who, like himself, looked deeply into the spirit and language of the statute and into the intricate problems to be solved; and, on the other hand, the chief requirement of the railroads forming the Association was a high-minded, impartial man, thoroughly public spirited, yet wise enough and sufficiently well-informed as to the laws of the business world to make no foolish attempts to achieve the impossible. Mr. Walker's work in the Association, like Mr. Hayden's later in the Joint Traffic Association, was a thankless task, as it proved unsuccessful; but, as in Mr. Hayden's case, the work, nevertheless, was of the highest order.

Mr. Walker's success in the Association led to his selection as Receiver of the Atchison, and his success as Receiver was what made him Chairman of the reorganized company. The very gratifying results of the administration of the Atchison during the last five years, both to the public and to the people of the States traversed by the company's lines, afford the best possible commentary on the character of the management during that time. As the head of a great railroad Mr. Walker's position was somewhat like that of the late Charles P. Clark, of the New Haven road; he was not brought up as a railroad man, and his ability consisted largely in guiding the activities of others. But, it is needless to say, there is no kind of work that demands higher talents than this.

The following vote was adopted by the Board of Directors of the Atchison, Topeka & Santa Fe Railway Company at a special meeting held on April 13, 1901:

Although it is not possible by formal resolution to express either our personal feelings of sorrow for the death of Aldace F. Walker or our sense of the loss which the company has sustained, we wish to record permanently our appreciation of his character and ability and of his services to this company.

Throughout his whole honorable career, in his early practice as a lawyer in his native State of Vermont, during his meritorious service in the Union Army through the Civil War, and later in the various responsible positions which he filled, Colonel Walker was distinguished for uprightness and honor in all his dealings and for faithfulness to duty. He was a man of unusually large information, and his mind was notable for the rare qualities of fairness, tolerance and sound judgment. In all the important position which he held, as a lawyer of high rank, as a member of the Interstate Commerce Commission, as chairman of the Western Traffic Association and of the Joint Committee of the Trunk Line and Central Traffic Associations, as Receiver of the Atchison, Topeka & Santa Fe Railway, and as Chairman of this board, he performed all his duties with credit to himself and to the satisfaction of all. The wide range of his



Aldace F. Walker.

official duties and his cordial human sympathies brought him into personal relations with a very large number of people, and he was always so courteous in manner and so kind in feeling that everybody who knew him became his friend. Sorrow for his death will be felt widely and with unusual sincerity, and by none more keenly than by his associates of this board.

Relative Cost of Filling Trestles.

BY I. O. WALKER.

We find in a recent number of the *Proceedings* of the Engineering Association of the South a paper by Mr. Walker, Assistant Engineer Nashville, Chattanooga & St. Louis, a paper describing and discussing certain work done on that road in filling trestles. This kind of work is now so important that we give considerable space to extracts from the paper.

I compare two trestles near Paris, Tenn.

Bridge 64.3 has 21 double-deck bents; balance, single-length piles; all piles and posts are selected red cedar; intercaps, pine, covered with galvanized iron; 6 piles to bent in single-deck part. Cost, $5,034. Height, 46 ft.; length, 576 ft. Total cost per ft., $8.74.

Bridge 62.8, filled; length, 490 ft.; height, 48 ft. Cost to fill and pull, including 8-ft. brick arch culvert on pile and concrete foundation, $14,294. Cost, per ft., $29.11.

To compare the first cost of treatment of these two bridges:

The cost of the deck of No. 64.3, including bracing and upper deck posts, was $4.50 per ft. Deduct 12 cents per ft. for first cost of track ties, and we have $4.38 as cost of deck over cost of track. Assume average life of bridge timber at six years and cedar piling at 25 years, the yearly charge for renewal alone will be $518.16. This capitalized at 5 per cent. represents $10,363.20; to which add first cost of bridge, and we have $15,397.20, or an initial investment of $26.75 per ft.

Bridge 62.8 cost	$29.11
Bridge 64.3 cost	26.75
Difference	$2.36

The relative cost of track and bridge maintenance is ignored, but the bridge is far the more expensive. Due weight should be given to the fact that, with the fill, there is no danger from fire or any of the accidents peculiar to trestles. These two bridges are compared to show actual cases and to eliminate theory. If I were to estimate what could be done, the showing would be more in favor of filling, as a small culvert would carry the water at Bridge 64.3.

To compare other trestles:

Trestle 142.6; height, 31 ft. Two hundred and fifty two ft. were rebuilt on single-length cedar piling, 6 piles to the bent; 420 ft. were filled; no culvert. Cost per ft. for rebuilding, $8.75; cost per lineal ft. for filling, $7.38. In this case the cost of riprapping the new fill is charged to the filling. The shovel pit was within three-fourths of a mile of the bridge, with straight track between them, and ample side-tracks, hence favorable showing.

Bridge 57.5; 19 ft. in height; no culvert. Three hundred and eight ft. were filled and pulled; 192 ft. were rebuilt on cedar piles. Cost of filling, $3.20 per ft.; cost of rebuilding, $5.02 per ft.

Bridge 90.9 height, 23 ft.; no culvert. Four hundred and twenty ft. were rebuilt; 436 ft. were filled. Cost of rebuilding, $5.77 per ft.; cost of filling, $5.10 per ft.

From the above it is to be inferred that trestles under 25 ft. in height can be filled as cheaply as they can be rebuilt—if we consider first cost only—and that it is true economy to fill trestles under 50 ft. in height, provided the water way required does not present extraordinary difficulties. In many cases, where a small culvert or iron pipe can be used, the showing will be much more favorable for filling than that above.

Of the trestles above referred to, 62.8, 57.5, and 142.6 were filled with the steam shovel, at a cost of from 10 cents to 14 cents per yard; 90.9 was filled with scrapers, by contract, and cost 14 cents per yard for filling alone.

In all the above statements of actual cost of filling trestles, the cost of track ties is omitted, as somewhat indefinite, but is about 12 cents per lineal foot on this division. The cost of handling, hauling, and placing ties and spiking the track is included in statements above, as is also the cost of maintaining the track for six weeks and ballasting the same.

The cost of filling shown includes all costs of engineering, pulling out old trestle, cost of borrow pits, and damage, if any.

An interesting question often comes up as to whether or not short ends of trestles should be filled or rebuilt; provided, of course, that from 4 ft. to 24 ft. can be spared, not needed for waterway.

Recently we made examination of our records to decide just what had been the gain in first cost of filling a great many short ends, the total for any bridge being less than 24 ft. The cost of riprapping the new fills is not included, as we riprap the ends of bridges, anyway.

We filled and pulled 998 ft.; the filling amounted to 3,721 cu. yds. The total cost of filling and pulling out the old trestles and maintaining the track for six weeks on the new fills was $1,137. The cost of rebuilding the same amount of standard trestle would be $5,030. Eighty-seven trestles are covered by above statement, or an average of slightly less than 12 ft. per trestle.

When trestles have been filled with scrapers, or when material has been leveled out with teams after unloading from the cars, the ties and stringers are removed within from 10 to 60 days after the filling is complete. In case the work is done with wheelbarrows, or has been simply dumped from cars, the fill is allowed to stand about one year. Only stringers and ties are removed; none of the caps, posts, bracing, or piling are disturbed. The timber left in it has caused us no trouble.

Most of the pulling has been done with a derrick car equipped with a hoisting engine and boom 24 ft. long. Usually the rails are taken up from 60 ft. of track, the ties are removed, and the stringers are lifted out by the derrick car and swung out of the way. The boom is furnished with a pair of heavy tongs, so very little digging is required to get the stringers out. The earth is then leveled down, the track ties put in place, and the rails relaid and spiked.

The cost per foot of pulling varies inversely as the length of the trestle. Some long trestles have been pulled out for 12 cents per ft.; some short, isolated trestles have cost several dollars per ft.

Many of the trestles have been pulled out by the bridge gangs, using only their bars and track jacks. There is no gain in cost from using the derrick car, but there is a gain in time required to pull a trestle, which is important where trains are thick. The locomotive is also useful in hauling and delivering ballast and ties.

The list below, showing the various kinds of grading, would indicate that the work could always be done most cheaply with a steam shovel. In general, this is true; but in basing an estimate on this list it should be borne in mind that the large fills have been made with the shovel and the smaller fills by other methods. The cost of shovel work increases rapidly with the haul and with any unusual difficulties about unloading, and depends almost entirely on the amount of traffic that interferes with the movement of the shovel trains.

The cost of bridge repairs, where the earth is pulled off by the locomotive, is considerable; but where the unloader is used, this cost is very little above ordinary maintenance. By "unloader" is meant the Lidgerwood Rapid Unloader, which is now so well known as to need no description. There is nothing peculiar in our arrangement of the equipment. The cars are used without sideboards, usually 14 cars to the train. One engine is used, unless the distance from pit to trestle is over one mile.

When trestles are filled with a steam shovel, the material should be leveled out, as unloaded, by teams and scrapers. The cost of spreading for trestles under 30 ft. in height will be about 2 cents per yard, and for trestles 50 ft. in height the cost will be about 2.8 cents per yd. Rainy weather increases this cost.

This additional cost will be repaid in less cost of bridge repairs, and the trestle can be pulled as soon as filled. There will be, practically, no shrinkage.

Some contractors and filling gangs, using scrapers or wheelbarrows, will complete their work without damage to the bridge; others, by careless filling, will cause the trestle to move out of line, with corresponding bill for bridge repairs. The fill should be brought up in nearly level layers from 2 ft. to 4 ft. deep.

When trestles are filled by dumping without spreading, there is great danger of the fill sliding out, and this danger is increased if the earth is spread from the top by using a spreader. The layers of earth are nearly vertical, instead of horizontal, as they should be. The uneven settlement of the fill throws the trestle out of line and surface, and frequently displaces the posts or piling.

Probably some one will ask: What is the rate of settlement or shrinkage? It is, practically, nothing for scraper-made fills, and about 10 per cent. for fills made by dumping. In nearly all our contract work the quantities are measured in the borrow pit.

In further comparing steam shovel and scraper work, it should be noted that many times we can secure no suitable material near the trestle for borrow pits, while, by using the steam shovel and train, we may get good material within a reasonable distance of the trestle.

In discussing steam-shovel work, I would call the attention of the Association to the remarkable record being made on the Kansas City Southern Railroad. Here we have earth moved and unloaded for 4¼ cents per yd., and placed under the track and on the fill for slightly less than 10 cents for total cost. For ordinary trestle filling, at this rate the earth can be spread with teams and trestle removed for less than a total cost of from 8 cents to 10 cents per yd. This means much to the locating engineer and investor. Temporary trestles can be built out of whatever material may be at hand, and the road opened for traffic, and begin earning money while the temporary trestles are being filled, for about one-half the cost of doing the work by contract from borrow pits or adjacent cuts. At the same time, cuts are being lowered and grades reduced.

When filling trestles, only good material should be used. No consideration as to first cost can be consistently urged as a reason for putting treacherous material into any fill. A sliding fill is very difficult to repair, and is a constant source of danger.

In the cost list reference is made to side-dump cars. These cars hold about one yard, are mounted on four wheels of 24-in. gage, and trip to one side. We usually handle them with men; sometimes with a mule. One main-track rail is used until the pit is reached, when a switch point is used, and the track turned out so as to be close to the bank. We have found them handy, as they are easily moved out of the way of passing trains. The excessive cost of handling earth with them has caused us to practically abandon their use.

We have made a practice of protecting the new embankments by planting Bermuda grass all over them. Usually tufts of grass are set about 2 ft. apart each way. A solid sod will be formed within a year. When spreading earth dumped by trains, we select the richest material for the outside, as far as possible, the object being to get material in which the grass will take root quickly. I do not think, however, that the grass will grow very successfully north of the Ohio River; in fact, we have very little of it growing well in Northern Kentucky. It prefers dry weather and a hot sun.

High fills should receive careful attention for a year or two. Whenever the rain washes holes in the fill, they should be promptly filled with good earth. Once the fill is thoroughly sodded over, the wash will be very slight.

Before beginning to fill trestles of more than 15 ft. in height, struts of old material should be fastened under the caps and between the ends of piles or posts. If a frame trestle is being filled, these struts must be used on top of and under all intercaps to keep the earth from driving the posts or piles out of position. Before arranging for filling high trestles, it is well to examine the bottom. Pits should be dug, and two or three piles should be driven at different points to make sure that the bottom will carry the fill. The settlement of the fill can be followed by dumping more material, but excessive settlement will wreck the culvert and may lead to very expensive repairs. In three cases on our road an examination of the bottom has led to the use of pile and concrete foundation for our culverts.

As to the advisability of filling trestles by contract or by gangs organized for the purpose by the railroads my experience, based on 14 years spent largely in handling this class of work, inclines me to the belief that this work should usually be done by the company. The delay to trains that are inevitable where steam-shovel work is going on are a source of great annoyance and expense to the contractor. If he fails to allow for them in his bid, he will lose money; if he attempts to cover them in his bid, he usually allows so wide a margin as to increase the cost far above what it should be. In general, it may be assumed that the railroad company can do this work about as cheaply as the contractor, and will do it far better. It may be said that specifications will cover all essential points. They never do. The contractor who is bidding close will expect a very considerable share of his profits to grow out of the evasion of a strict interpretation of the specifications. I presume it is hardly necessary to refer more specifically to material to be used in fills, but I would call the attention of those members engaged in railroad work to the danger of using material ditched from cuts for filling trestles. A great deal of this material can be used, but none of a gumbo nature should be allowed.

RECAPITULATION OF FILLING COSTS.

METHOD.	Lineal Feet.	Cubic Yards.	Direct Cost.	Miscellaneous Cost.	Total Cost.	Per Cubic Yard, Cents.
Steam shovel	3,194	193,083	$20 728.81	$1,395.42	$22,124.	11.45
Dump cars	947	19,389	3,788.14	202.00	3,990.14	20.57
Scrapers	615	9,600	1,916.88	230.00	2,146.88	22.36
Casting	1,232	2,843	486.85	26.94	513.79	18.07
Work train	319	1,341	193.37	101.00	294.37	21.95
Wheelbarrows	3,781	14,135	2,803.65	116.00	2,919.65	20.65
Scrapers	6,384	199,434	30,750.38	2,973.13	33,723.51	16.91

Total lineal feet filled	16,472	Total number feet pulled	16,472
Total cubic yards	439,825	Total cost of pulling	$6,566.08
Total cost of filling	$65,712.57	Average cost per foot pulling (cents)	39.86
Total average cost per cubic yard (cents)	14.94		

Items of Cost in Filling Trestle No. 62.8.

Item.	Amount.	Cents Per Cubic Yard.
Steam shovel crew	$1,485.94	02.38
Steam shovel laborers	1,053.45	01.69
Train and locomotive crew	1,565.86	02.51
Spreading earth after unloading	1,983.12	03.18
Engineering	370.05	00.60
Clearing right of way	54.40	00.08
Borrow pits and right of way	367.76	00.59
Miscellan'us—moving braces, bridge work, pulling	818.25	01.31
Coal waste, oil, and engine repairs.	1,185.33	01.90
Yardage by shovel, 62,386 cubic yards	$8,884.16	14.24
Yardage by contract, 1,144 cubic yards	148.75	13.00
Cost of culvert	5,261.09	
Total cost of work complete	$14,294.00	
Estimated cost	13,639.55	
Cost exceeded estimate	$654.45	

The Burlington-Great Northern-Northern Pacific Combination.

President James J. Hill is quoted in an interview at St. Paul as announcing the completion of negotiations for buying the Chicago, Burlington & Quincy and consolidating it with the Great Northern and the Northern Pacific. Mr. Hill declares, according to the interview, that the Erie is not to be included, and that there is to be no transcontinental line.

What he wants of the Burlington, according to this despatch, is not an outlet to Chicago as a link in an Eastern system for the Great Northern and Northern Pacific, but chiefly a connection with St. Louis and Kansas City. He wants to reach the cotton of the South for transportation over the Great Northern and Northern Pacific, and his steamships now building, to Oriental markets, and to bring back in return the lumber of Oregon and Washington to distribute through the prairie States of the South. It is no part of his purpose to use the Burlington as an exclusive outlet for the Pacific roads to Chicago. On the contrary, all the six Chicago roads which bring business to the Great Northern and Northern Pacific will have their own share of the traffic now.

Mr. Hill said that the Great Northern and the Northern Pacific and Burlington would be merged under one central management at St. Paul, where preparations have been made for centralizing the forces of the three great roads. Mr. Hill explains his desire to obtain the Burlington on the ground that the Northern roads were losing much valuable business originating in Burlington territory, and to save this it was necessary to get control of the road. The lines of the Northern Pacific in Manitoba which had been leased to the Manitoba Government for 999 years, but which detail lacked the approval of the Ottawa Parliament, will not be sold, Mr. Hill having vetoed the proposition.

When the three properties are merged they will form by far the largest aggregation of railroad mileage under one control ever brought together in this country. The Burlington System, including the lines east and west of the Missouri River, comprises 7,840 miles, and its capital stock outstanding in January last was $98,769,800. The additional 10 per cent. increase recently offered is not here included. The Northern Pacific, with the lines in Manitoba, which, according to the above statement, are not to be leased, operates 5,487 miles, and it has outstanding $80,000,000 in common stock and $75,000,000 in 4 per cent. non-cumulative preferred, a total of $155,000,000. The Great Northern operates 5,418 miles, and its capital stock outstanding in January last was $98,417,250 out of $100,000,000 authorized. This does not include the $25,000,000 soon to be issued to acquire new lines and for other purposes. The mileage of the three companies will thus aggregate 18,745, and the outstanding capital stock, excluding proposed additions, $352,187,050. Should the Erie be included in the combination, it will add 2,271 miles of road, and an outstanding capital stock, common and preferred, of $171,240,200. This would bring the total mileage up to 21,016 and the capital stock to $523,427,250.

No plan has yet been announced for the consolidation of the several companies, nor even for the taking over of the Burlington. According to report, every $10,000 of Burlington stock is to receive $22,500 in 3½ per cent. bonds, which is equivalent to 7⅞ per cent. annual dividends on the stock. The stockholders in 1899 and 1900 received 6 per cent. This increase would add to the annual demands about $1,852,000, which is nearly equal to the surplus of 1900 ($2,099,083), and considerable more than the surplus of the year before ($1,489,929). Such a load would seem to be uncomfortably close to the danger point, and it is difficult for the outsider to understand how there can be any profit in it to the promoters unless there shall result extensive economies and new opportunities from the combination.

Electric Traction for Heavy Railroad Service.

We recently published an abstract of a paper presented before the Northwest Railway Club by Mr. E. P. Burch on the above subject. At the March meeting of the club the paper was discussed and below are extracts from the remarks of two of the members.

Mr. David Van Alstine (Master Mechanic C. G. W. Ry.)—As I understand this subject, the economy that is to be gotten with electric traction is more a matter of a large number of small trains than anything else. Out of curiosity I have made an effort to determine what might be the electric cost applied to an existing steam road. The road that I have taken is 180 miles long, the maximum grade is 1 per cent., 5 miles long. The average trains per day in both directions are: Passenger, 6; freight, 9. The number of freight engines required for this average service, in fact for all the service, is 18; passenger, 9; switching, 8; total, 35. The average 1,000 ton miles per month is, passenger, 10,610; freight, 38,080; switching, 15,870. Average coal consumption per month: Passenger, 1,591 tons; freight, 4,056 tons; switching, 1,587 tons.

Now, in determining the probable average horse power that would be required from an electric plant I have made 10 per cent. reduction from the total coal consumption by steam locomotives, assuming that that amount would be lost in firing up. And then I have assumed that 7 lbs. of coal per horse power hour is about an average for steam locomotive service; that gives an average horse power of 2,500. The assumed capacity of the power house is 20,000 h.p., eight times the average horse power, but I can conceive of combinations of trains and business on that particular road at times that would require all that power. The cost of fuel at power stations is taken at .3c per horse power hour; labor, repairs, etc., at power stations, .3c per horse power hour; loss from power house to drawbar of motor, 50 per cent.; motormen and despatchers at about two-thirds of what engineers, firemen and despatchers would amount to with steam locomotives. Thirty electric locomotives at $10,000 each it is assumed are necessary. The cost for repairs of electric locomotives is taken as one-half that for steam locomotives. The cost of power stations is taken at $75 per horse power; trolley line, $1,500 per mile; feeders, $500 per mile; transformers, three miles apart, at $2,500; rail-bonding, $200 per mile; interest and depreciation on all equipment, 5 per cent. each.

Working with those assumed figures, the total cost, including interest and depreciation on locomotives, shops, roundhouses, water stations, including fuel, labor, oil, waste and supplies—everything pertaining to the mechanical department—we get a result of 61.61c per 1,000 ton-miles for steam, and 81.65c for electricity. Now, analyzing these figures, the principal items in the steam cost are, fuel, 41 per cent.; engineers, firemen and despatchers, 27 per cent.; repairs to locomotives, 18 per cent. The principal items in the electric cost are, fuel, 21 per cent.; labor and repairs at power stations, 21 per cent.; motormen and despatchers, 13 per cent.; interest and depreciation on power houses, 32 per cent. You can see from these figures, if we have them anywhere near correct, that the largest item in the electric cost is the interest and depreciation on the power houses and line equipment, the fuel account being a comparatively small item.

It is also easily seen that if the business on this particular road should increase to such an extent as to be comparatively uniform, and require a large percentage of the maximum capacity, then the items in the steam cost would remain fairly uniform, that is, some of them would decrease, but the total would decrease very

slightly, whereas with the electric cost it would begin high up for the small average power demanded, but as the average power increased the drop in the total cost per 1,000 ton miles would be very rapid. In other words, if curves were plotted, with ordinates giving cost per 1,000 ton miles and abscissas giving 1,000 ton miles handled in any given time, the steam line would drop slowly to nearly horizontal. The electric line would begin above the steam line, but drop more rapidly and cross it, and the point where they crossed would indicate the volume of business had been reached where the cost for steam and electricity were equal.

Mr. G. H. Goodell (Mechanical Engineer Northern Pacific Ry.)—When we remember the small horse power involved on most electric roads now in operation, and the light weights and low speeds, it is hardly likely, with the large increase in these necessary under steam railroad conditions, that the cost of repairs and maintenance of the motive power of an electric road will be any less than that of a steam road. It is to be regretted that more reliable and extensive data are not obtainable. Repairs and maintenance of passenger cars would be the same in either system. While the operation of a motor car involves far less labor than that of a steam locomotive and its tender, yet the danger that the operator might be incapacitated makes it necessary to have two men at the head of the train, although one man would easily be able to do all of the required work. As it takes two men to run the ordinary passenger locomotive, there would be no advantage of one system over the other. It would be a mistake to save wages by utilizing a lower degree of intelligence or skill for motormen or their assistants than is now used for engineers and firemen on steam railroads; the tendency to do this has cost electric street railway owners many thousands of dollars; more, in fact, than is usually realized. Passenger train service would not be affected by the use of one system or the other. Central power station service is an additional charge against the electric road. Were the operative method changed, train services (wages) would be greatly increased.

Instructing Trainmen on the Boston Elevated.

In preparation for the opening of the elevated line of the Boston Elevated Railroad from Sullivan Square, Charlestown, southward to Townsend street, about five miles, which will take place within a few months, Mr. S. S. Neff, Superintendent of the elevated lines, is now instructing the prospective motormen in a school, elaborately equipped, which is doubtless the most complete establishment of the kind in existence. The trains on these elevated lines will have automatic air-brakes, and the road is to be equipped with automatic block signals, so that the school and its workings will be of interest to officers not only of street and city lines, but of all railroads, for the practice with both brakes and signals will be substantially in accordance with the same principles that prevail on standard railroads. On account of the frequency of trains the standard of efficiency required of the men will, of course, necessarily be the highest, so that an officer of the average steam railroad is more likely to find Mr. Neff's teaching of too high a grade than otherwise.

The equipment of the school, which is in a large room in the company's building at Sullivan Square, consists of two model cars, a large plan of the whole road, showing the signals, and a stereopticon and views to show on a large scale colored pictures of all the apparatus on the cars and all kinds of signals in every position. Hand-motion signals, according to the standard code of the American Railway Association, are also shown.

The 100 cars which will be put in service at the opening of the line are all motor cars. Each one has complete air-brake apparatus, and on each end has a controller, an engineer's brake valve and pressure gages and an emergency air-whistle. The main air reservoirs of all the cars of a train are connected together by a separate line of pipe, and equalized. The controller of a car, instead of acting directly, acts on an electrical apparatus called a "throttle," which, in starting, automatically applies the power gradually, so that a careless motorman cannot possibly start a car too suddenly. Each car has a lever hanging down to near the level of the rail for automatically applying the air-brakes in case a train runs past a signal indicating "stop," each stop signal being fitted with a trip for this purpose. The air-brakes can be "bled" from inside the car, as well as outside.

The plan of the road is drawn on a board, standing on its edge, about 14 ft. wide and 7 tt. high. A view of this plan, traced from a photograph, is shown herewith. Each signal blade is represented, in the proper place, by a miniature tin blade, properly colored, and about 2 in. long. This is pivoted so that it can be shown in either of its two positions, and it has a lamp, a very small incandescent electric, embedded in the board. The spectacle frames are fitted with properly colored translucent spectacles. The stereopticon views include pictures of every detail of car and signal equipment that a trainman can need instruction on, and the signals are colored.

With this board a pupil can be required to set the signals for any route, simple or complicated, and his understanding of the rules thereby effectually tested. A large number of men now employed as motormen on the surface street car lines of the company have already begun their studies in this school.

In the illustration it will be observed that all of the signals in the subway are dwarfs, as, for example, those at Boylston street station. In the case of two-arm signals the post is shown on the diagram; in other cases not. There are no distant signals, except in a few cases where the line is nearly straight for a long distance. Just before the photograph was taken the signals were cleared for a train to run from Sullivan Square through the subway to Dudley street; but two or three of the blades appear to have been misplaced. Semaphore arms controlled from a cabin have a white band across the face; while those which are purely automatic are plain red.

The signals, put in by the Union Switch & Signal Company, are the Westinghouse electro-pneumatic, and the rail circuit controlling them will be carried in one direction by a wire, one of the rails being required for the return of the power circuit which propels the cars.

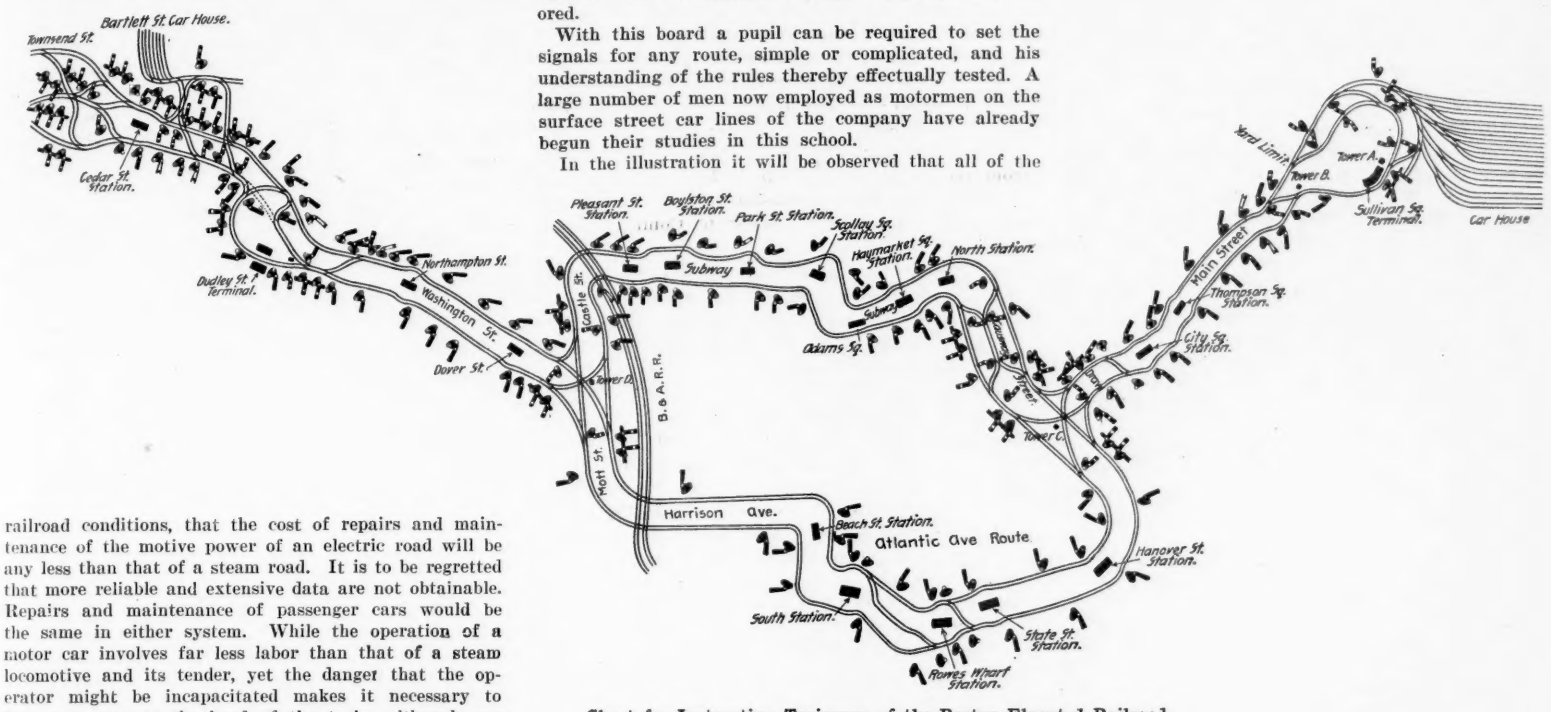


Chart for Instructing Trainmen of the Boston Elevated Railroad.

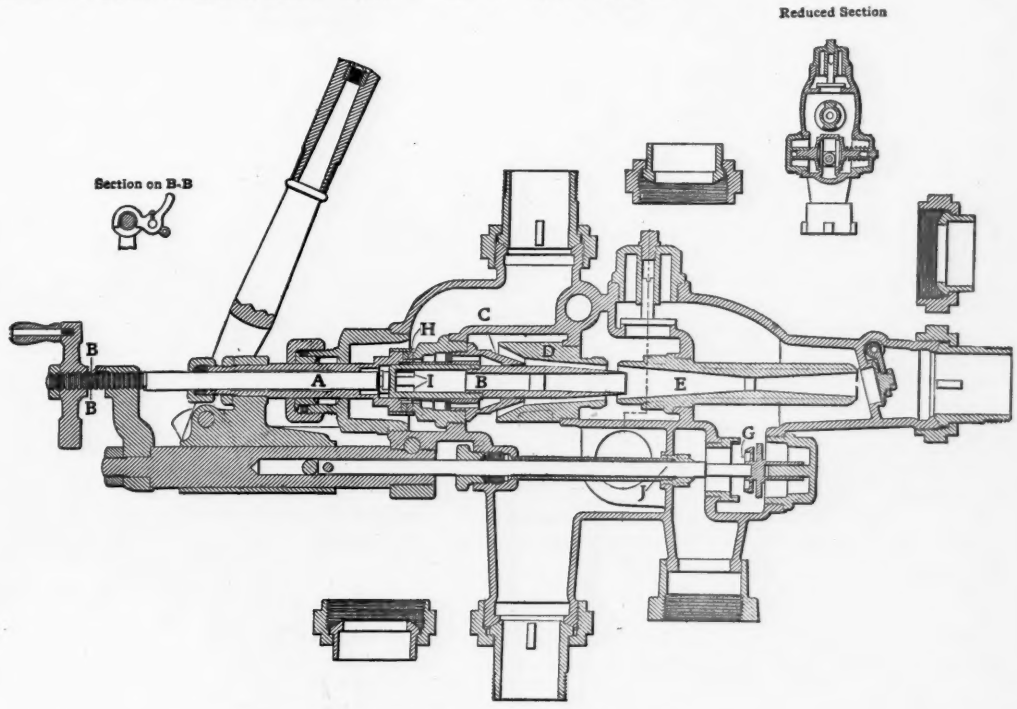
The Lunkenheimer Standard Locomotive Injector.

The accompanying sectional view shows the Lunkenheimer '99 Model standard locomotive injector. This injector has been tested under steam pressures from 25 lbs. to 300 lbs., and one of the strongest claims is that it is especially adapted for high pressures, and requires no adjustment for changes in steam pressure. All parts are easily accessible for cleaning and repairs, and the large and straight passages offer little chance for failure from obstruction in tubes and jets.

In starting the injector the lever is pulled in the usual manner, steam being admitted through jet C and the valve H being opened to admit steam to the annular space, of which the movable steam tube B is the core or center. Steam passing through the tube B forms the vacuum in the usual manner, the water meanwhile passing through the check valve A being delivered to E and to atmosphere past the overflow valve G. When the lever is drawn out further the steam ports I in the movable tube B admit steam to the tube, and the water is then forced through the combining tube E, passed to the line check and into the boiler, the overflow valve G having meanwhile closed. The latter movement is caused by the rod J being withdrawn from the valve G.

The water feed is regulated by the crank handle, which also controls the movement of the steam tube B. A section of the crank handle on the line BB is shown in the illustration. When the water feed is cut down the steam supply is reduced in proportion, this being a feature in which the Lunkenheimer injector differs from injectors where commonly the steam and water supplies are separately regulated.

This injector is one of the more recent devices put on the market by the Lunkenheimer Company, of Cincinnati. A book of directions is furnished by the company in which full instructions are given for the attachment and operation of this device, valuable hints for its care and maintenance, and also on the subject of injector work in general.



The Lunkenheimer '99 Model Injector.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The movement toward a possible modification of the rail sections as laid down by the American Society of Civil Engineers makes a little progress. At the regular meeting of that society, held April 3, a resolution was passed putting in motion the machinery for the appointment of a committee to look into the subject. It does not follow, however, that the committee will be appointed, and at any rate it cannot be appointed for five months yet. It seems very desirable that the Society should not dismiss the thought of such a committee without careful consideration. Our judgment is that the development of the art of making rails will result soon in an increase of the thickness of the flange. For many reasons it is highly desirable that the lead in any change should be taken by the American Society of Civil Engineers, which has given to the world the present admirable series of sections. At least the appointment of a committee to consider the matter can do no harm. There is a reasonable chance that it may do considerable good not only to the Society itself but for the railroads and the rail makers.

The compilation of railroad gross earnings for March (*Financial Chronicle*) shows that the improvement still continues. The gains on 108 roads, comprising 105,343 miles, were $4,230,000, or 7.43 per cent. above the earnings of the corresponding month a year ago. This increase follows a gain of $6,342,000, or 12.5 per cent. in 1900; $2,896,000, or 6.35 per cent. in 1899, and $6,244,000, or 15.25 per cent. in 1898. Of all the railroads reporting, 35 have suffered decreases. Chief among these are the Great Northern, $115,000; the Minneapolis, St. Paul & Sault Ste. Marie, $60,000, and the Burlington, Cedar Rapids & Northern, $42,000. The falling off in 63 roads is largely due to the smaller wheat movement and crop shortage in the Northwest. Among the roads reporting gains, the Illinois Central stands at the head with $358,000. Then follow the Missouri, Kansas & Texas with $323,000; the Baltimore & Ohio, $321,000; the Missouri Pacific, $312,000; the Texas & Pacific, $277,000; the New York Central, $231,000, and the Chesapeake & Ohio, $217,000. The falling off of wheat receipts in the Northwest is shown by the fact that the Duluth deliveries were but 1,215,000 bushels, against 5,417,000 bushels a year ago. At the same time there has been an increase of the receipts of wheat at all the western primary markets from 15¾ million bushels in 1900, to 16¼ millions this year. There was a falling off in corn receipts in the same markets from a little over 20 million bushels in 1900, to a little more than 15 million bushels this year. The receipts in cotton at the southern ports were 508,110 bales in March, 1901, against 450,056 bales the preceding year. The overland movement of cotton was considerably less amounting to 97,290 bales, against 163,325 bales in 1900, but whatever loss there was from the cotton movement was offset by the activity of general trade.

Supreme Court Decision on the Fourth Section.

The long and short haul clause of the Interstate Commerce law has again been passed upon by the Supreme Court of the United States. The case is one against the East Tennessee, Virginia & Georgia in which complaint was made that rates on freight from the East through Chattanooga to Nashville were lower than to Chattanooga. The decision is by Justice White and it is adverse to the complainants, and in favor of the railroads, reversing the decisions of the lower courts and of the Interstate Commerce Commission. This case is more than 10 years old, the Interstate Commerce Commission's opinion, prepared by Mr. Knapp, having been given in December, 1892; but the people of Chattanooga, who, through their Board of Trade, made the complaint, have had their interest kept alive by decisions now and then from the lower courts. The title of the case now decided is the East Tennessee, Virginia & Georgia Railway et al. vs. the Interstate Commerce Commission.

The arguments in the several trials of this case appear to have been both voluminous and subtle (so that even the Circuit Court of Appeals apparently shrank from the task of thoroughly elucidating them) and, notwithstanding the masterly way in which Mr. Justice White clarifies the clouded stream of words these numerous inquiries on the Cumberland and Tennessee produced by, we are not sure that we thoroughly grasp all of the nice points of the decision; but from the impression that we get we should say that, practically, the restraints of the long and short haul section are now removed more completely than ever, so far as they affect any place where competition prevails; and furthermore, that the power of the Commission to apply the law for the reduction of rates under the first and third sections is also destroyed, so far as concerns any situation where the fourth section can possibly be made to apply. Those who aver that the decisions of the courts are what has prevented the country from reaping valuable benefits from the Interstate Commerce law will now have one more count to add to their indictment.

The decision of the Commission in favor of Chattanooga was based chiefly on the disregard of the fourth section (long-and-short-haul clause); but by the time the case got to the Supreme Court, a decision of that court, in another case, had established the right of the railroads without asking leave from the Commission, to reduce rates to Nashville, without reducing to Chattanooga, provided competition at Nashville made it necessary to reduce in order to get a share of the business. This being the case, the Commission, on the appeal, argued that the disparity of rates, as between Chattanooga and Nashville, was so great that justice required the court to uphold the Commission's order, by authority of the third section of the law, which forbids undue preference and unjust discrimination. If the court should refuse to grant this point, then, said the Commission, the Chattanooga rates ought to be reduced on the ground that they are unreasonably high, *per se;* for it was shown that the rates to Nashville, much lower and for a much longer distance, were adequate. And, thirdly, the Commission argued that the rates to Chattanooga must be declared unreasonably high because they had been established (years before) by an agreement among the roads which stifled competition. The roads, having thus prevented competition from having its normal influence, should not be allowed to favor Nashville by the opposite process of competing too severely. The reasoning by which the Supreme Court rejects all these arguments fills a dozen pages; we will give the main points as briefly as we can:

1. As to the third and fourth sections. The several provisions of the law must be interpreted together. The Supreme Court has decided that railroads may take railroad competition into consideration when they have to decide whether they are justified in disregarding the long-and-short-haul rule; to now tell them that the third section always forbids such disregard (because it always forbids discrimination) would be to nullify the fourth section. 2. The permission to use their own discretion, which the fourth section gives to the railroads, is a vital element of the law; the prohibition found in the third section is not against discriminations produced by rates which are forced down by competition—competition which the law recognizes—but is against discriminations arising from voluntary and wrongful acts of the carriers complained of. The discrimination in favor of Nashville and against Chattanooga did not arise merely from the act of the carriers; if the rates had not been reduced, the cities would have remained in the same situation as before, for the freight would have gone to Nashville over another line. 3. It is still true, says the court, that if a railroad meets competition by carrying goods at less than cost, it would be working unjust discrimination against the shippers of other freight.

The Supreme Court finds that the Commission's order does not correspond to its findings of fact; and the two lower courts approved the order in spite of this inconsistency; so that the Supreme Court cannot now decide the case without taking up and reweighing all the evidence. It decides not to do this, for it is entitled under the statute, to the aid of the previous enlightened judgment of the Commission before taking up a subject of this kind. The order reversing the decree of the Circuit Court of Appeals is made, therefore, without prejudice to the right of the Commission to retry the case, with or without new evidence and pleadings, "and determine the matter according to law."

We do not understand that this decision has any immediate effect on the fortunes of the cities interested. Nashville would have low rates in any event, and Chattanooga gets no change. Newspaper accounts say that merchants of Chattanooga will now take measures to increase and foster their means of water transportation, but nothing definite is reported. The importance of the decision lies in its amplification of former judicial utterances concerning the force of the Interstate Commerce law, and particularly in its interpretation of the third and fourth section, apparently holding the fourth to be substantially paramount to the third.

Specifications for Steel Axles.

Elsewhere is a report of a recent club discussion on the important subject of specifications for steel axles. We do not propose now to try to add to the discussion, except to emphasize two points that were brought out.

The first of these is the practical importance of settling on standard specifications. Mr. Marshall suggests that so long as specifications vary among railroads the tendency is to pull all the product down toward the lowest of these. He does not say this in so many words, but that is a fair statement of the principle. Mr. Onward Bates has lately brought out the same point in speaking of bridge specifications. He showed that the buyer whose specifications are above the ordinary grade to which the mills have settled down, probably does not get his specifications filled. Obviously, if the railroads will unite on the specifications that they want, they will raise the average output, and the steel that they specify will no longer be exceptional. There are other important elements of this matter of standard specifications as affecting the commercial interests of the steel makers; but those we need not consider now.

We notice that the familiar statement appeared in the discussion of which we speak, that if we lay down service requirements we should leave the makers free to fill those requirements. But the specifications proposed and under discussion were prepared by the makers, the users and the inspecting engineers working together. The makers have all the influence in the International Association that they are entitled to—probably all that they want. One of the things which some engineers like to say of the proposed specifications is that they are manufacturers' specifications. That is unjust; they are a compromise, and probably a judicious compromise. Statesmanship consists in getting something—not in getting all you want.

Further, the notion is probably fallacious that the buyer of steel should tell the maker that he wants his steel to do certain things and then keep his hands off. That is an easy but costly way to do business; it is contrary to the mass of human experience. The more the user knows about the steel from its beginning the better can he judge of the results in use; and co-operation between maker and user must be intimate and enlightened to insure real progress. At any rate, it is hardly worth while to discuss this phase of the matter; the users will not surrender their rights to know what they are getting and to specify elements and methods as well as results. Steel making and medicine are no longer black arts, although they still contain many mysteries, both for the patient and the practitioner, and the growth of knowledge among the patients is a powerful foe to quackery among the practitioners.

The second point of which we wish especially to speak now is that of the carbon content. That is not specified, but Mr. Wickhorst and Mr. Nelson both express the opinion that it should be specified, with an obvious leaning toward the highest limits now used by the various railroad companies. Those who have access to files of the *Railroad Gazette* will find in June 1, 1900, tables showing the practice of many railroad companies as to steel for locomotive axles and other forgings, and also for car and tender axles. He will find there that the carbon runs all the way from 0.20 to 0.50, but nothing higher. Obviously such a range cannot be right, and we venture the suggestion that 20 carbon will not give an axle high enough in elastic limit or tensile strength. We notice that the New York Central specifications issued last January and February have raised the carbon from the figures which we published a year ago. For locomotive driver and truck axles acid open hearth is specified, with carbon from 0.35 to 0.50; for cars, open hearth, passenger cars 0.30 to 0.40, and freight cars 0.25 to 0.35. The other specifications are full and reasonably severe; but we set out to speak now only of the carbon element.

Apprentices at the Baldwin Locomotive Works.

The Baldwin Locomotive Works has started in a serious way and on a large scale a system of apprenticeship designed to provide systematically for the future. On the face of it, and as a general proposition, this is one of the best things that a great manufacturing company could do for its own continued prosperity and for the nation. The development of manufacturing in this country has been greatly handicapped by the lack of systematic training of boys and young men for the vocations which they were to follow. Many things are responsible for this, among others the immense opportunities which have opened before the young men of the nation, making them impatient of careful training; the development among our people of the notion that an American can do anything and that he does not need to be specially educated; and, of recent years, the systematic opposition of the trade unions to any form of apprenticeship. In spite of these difficulties our astonishing wealth in natural resources and the energy, ingenuity, ambition and self-reliance of our people have carried us far towards the front as a manufacturing nation. The process has been wasteful, but heretofore we have been so rich in undeveloped resources that we could be profuse without suffering. We remember hearing in 1893 a wise remark by Prof. Reuleaux. Speaking after dinner one evening this sagacious gentleman reminded his hearers that the time was imminent, if it had not already come, when the Americans must learn the great lessons of economy; and the few years which immediately followed 1893 did a great deal to enforce these lessons.

The growth among us of systems of careful training of young men for the mechanical trades is an important fact bearing upon our national development. Consequently, one must look with pleasure upon the large enterprise of this sort on which the Baldwin Locomotive Works has entered.

This concern has established a special department designed to prepare the young men in its employ for their future work, and Mr. N. W. Sample, formerly General Superintendent of the Denver & Rio Grande Railroad, has been selected as chief of this department and has the matter now well organized. The forms of indenture for apprenticeship are now before us. Of these there are three, designated as first class, second class and third class, the first and second class being apprenticeship indentures, the third class being an employees' agreement. Apprentices of the first and second classes must have reached the age of 17 and bind themselves to remain until 21. The age limits are not absolute, but boys of 16 may be taken in, and begin their apprenticeship at 17. Likewise, the term of four years may be shortened in cases of special aptitude and ability. Furthermore, boys of the second class will ordinarily serve but three years as is said below. Both parties to the indenture sign an agreement designed to secure discipline, good conduct, fidelity and fair treatment on both sides. The company retains the privilege of dismissing the apprentice at any time for improper conduct, neglect of duty, disobedience or physical disability, and it is agreed that dismissal for any of the causes enumerated shall be final and conclusive evidence of the truth thereof, which clause is obviously important in avoiding the difficulty of proof. The apprentice receives wages on an agreed scale during his service and at the end of the full term he receives a certain agreed bonus. If the apprenticeship is ended before the full period for any reason other than dismissal for cause the apprentice gets a pro rata part of the bonus. If he is discharged for cause he gets no such bonus.

Apprentices of the first class agree to attend free night schools at least two evenings in the week for the first three years, where they will be taught elementary algebra and geometry for one year and mechanical drawing for two years. These apprentices must already have had a grammar school education, or its equivalent. They are paid 5 cents, 7, 9 and 11 cents an hour for each of the four years and a bonus of $125 at the end.

The apprentices of the second class agree to attend the night schools two evenings a week for the first two years, during which they will be taught mechanical drawing. These apprentices must have had an advanced grammar or high school education, and ordinarily will be required to serve but three years, because of their education. They will be paid 7, 9 and 11 cents an hour and get $100 bonus.

Young men of the third class are designated as employees, not as apprentices. They are to be over 21 and make a contract for two years, but may be discharged for the causes suggested in speaking of the apprentices. They will generally be technical school graduates, with some shop experience. They will be paid 13 and 16 cents an hour in the first and second years.

In all of the classes the pay is by the hour; the standard day's work is 10 hours. The company agrees to keep the young men at work steadily, while the young men themselves agree to work for more than 10 hours a day if called upon to do so. There is a clause also providing that if the hours of work in general through the shops are reduced to less than 10 a day the hours of the apprentice may be correspondingly reduced.

"Surprise checking" is taking on new horrors. On the Northern Pacific, according to a St. Paul paper, the company has for some time employed three "ticket exchangers," who board passenger trains at any point where they happen to see fit, and check up the accounts of the conductors, examining the tickets and other pasteboard in the hands of the passengers; but recently the management of the road has gone a step further and appointed two train collectors, who not only examine the conductors' work but take the whole of it into their own hands for the trip. The collector, on entering the train, requires the conductor to go through the cars with him and explain all the hat slips and other transportation in the hands of passengers. The conductors, according to this account, feel greatly chagrined at this implied imputation on their honesty; and the informant of the reporter exclaims, triumphantly, that in the four months since the collectors were put on, no conductor has been caught in wrong doing. We sympathize with these honest conductors, but the only consolation that we can offer is to remind them to remember not only that "an honest man will bear watching," but that honest men everywhere have to submit to watching all the time, because it is only by watching all of a class that the dishonest few can be detected. How much worse is the surprise checking for a conductor than for a ticket agent or a bank cashier?

TRADE CATALOGUES.

The 100 Per Cent. Splice Bar.—The Cambria Steel Company (general office, Philadelphia, Pa.; works, Johnstown, Pa.) is the sole licensee for the manufacture of Mr. M. W. Thomson's 100 per cent. rail joint. A pamphlet has recently been issued stating the principal points claimed for this splice. The engineer in special charge of the introduction of this joint is Mr. A. Morrison, German National Bank Building, Pittsburgh, Pa.

Machine Tools.—The Newton Machine Tool Works, Philadelphia, have recently sent out their catalogue No. 34, containing 192 pages of illustrated description of various machine tools. Electrically driven tools in great variety are designed and built by this company, and many of those tools are illustrated in catalogue No. 34. Especial attention has been given to machine tools for railroad shops, and there are several illustrations of machines admirably adapted to the work considered. Among these are cylinder and other boring machines, as for example, illustrated on pages 122 and 123, which are of particular interest to those who are repairing or building locomotives. A further list of machines includes band and cold sawing machines, combined milling and polishing machines, and many others which form a list too long to be here enumerated, some of the more interesting examples being radial planers and drilling machines, rotary planers and slabbing and slotting machines. The catalogue will be found a convenient handbook for reference when equipment of this kind is to be selected.

The Hall Signal Company, New York and Chicago, has issued the fourth edition of its catalogue of automatic electric signals. Believing further publication of detailed descriptions of its signals unnecessary, this feature of former catalogues is abandoned, and the present book, 4½ in. x 7 in., bound in leather, is devoted to pictures of details of various things made by the company, with reference numbers to facilitate giving orders. The book has 136 pages and the matter is very clearly classified and arranged. Among the instruments and machines shown are the well-known disk signal, both with and without electro magnets to hold the disk in the clear position; motors for working semaphores; relays, interlocking relays, electric switch locks, and electric slot instruments; electric bells, electric lever locks, track instruments, switch instruments, highway crossing bells, semaphore signals, batteries, lightning arresters and tools for use in automatic signaling. Last, but not least, comes the Bezer revolving signal, which is controlled by the Hall Company. The illustrations and the descriptive matter shown in connection with this signal are substantially the same as were given in the *Railroad Gazette* in 1895, 1896 and 1899.

What is the Value of a Railroad for Purposes of Taxation?

BY CHARLES HANSEL, C. E.

The Michigan Board of State Tax Commissioners has lately made a critical review of all the railroad properties of the state, for the purpose of determining the cash value of same in order that all property in the state may be taxed on a uniform basis. The work carried out by Prof. M. E. Cooley, who was selected to examine and report upon the value of all the several items which go to make up the cost of constructing a railroad, was very complete. The short time allowed him to carry out this work and the many difficulties attendant upon the organization and completion of the inspection will be appreciated by all who have read the description of it which may be found in *Engineering News* of Dec. 20, and more especially by those who have had the pleasure of examining the records and reports secured by Mr. Cooley.

The task put up on the Tax Commissioners is exceedingly difficult to fulfil to the satisfaction of those familiar with railroad problems, as many consider it impossible to determine now what it would cost to reproduce any certain railroad property, or to say what its present value is by calculating the cost of reproduction and deducting from this a certain percentage on each item for depreciation. One of the many difficult problems presented to Prof. Cooley to determine was the question of apportioning value of rolling stock and motive power, and it is quite likely that there would be found a great difference of opinion among railroad officials as to how this question should be solved.

The railroad companies operating in Michigan are divided into three classes:

1. Railroads owning or operating tracks wholly within the state.

2. Railroads owning or operating tracks in Michigan and other states—interstate railroads.

3. Railroads owning or operating tracks within the state and extending into the Dominion of Canada—international.

We may consider the distribution of the value of the equipment to the state of Michigan under the following divisions:

(a) Car mileage, (b) track mileage, (c) ton-miles (d) gross earnings.

(a) The freight car equipment owned or operated will include all cars, other than passenger, sleeping, baggage and express cars, and this equipment is floating throughout the United States and Canada, and is probably at no time all in the state. The car accounting system, used by all railroads, takes record of each mile traveled on all the various railroads; and a system of interchange is provided to avoid transfer. From this system, therefore, we may discover the total miles traveled by all cars, which is or may be so recorded as to inform us as to the car miles on main line, divisions and branches. If, however, any portion of the main line, division or branch is interstate then we must seek the proportion for the state by passing the car mileage on the percentage of miles of track of main line, division or branch, within the state.

(b) If we attempt to apportion rolling equipment wholly on the basis of miles of track owned or operated within the state we meet the objection of charging branch lines with the same density of traffic as main lines. The main line may lie mostly without the state, and its branch lines mostly within. For example, take the Lake Shore & Michigan Southern percentages in Michigan: Freight car miles, 4.8 per cent.; locomotive miles, 10.4 per cent.; passenger car miles, 11.4 per cent; track miles, 38.2 per cent.; freight earnings, 7.3 per cent.; ton miles, 4.4 per cent.; passenger earnings, 14.5 per cent.; passenger car miles, 13.3 per cent. Since earnings may be considered to represent the capacity to pay, and the freight and passenger miles the volume of business, it appears unwise to use the track miles alone as a measure of value, without considering its relation to the volume of busines as represented by car mileage. As in the case of the Lake Shore & Michigan Southern, the percentage of track mileage is more than twice as much as the other percentages.

(c) Ton-miles does not seem to be a term so accurately used as to warrant us in considering it as a proper unit of comparison. "From the standpoint of the transportation department, the ton-miles ought to cover all the freight, whether revenue or company, while from the standpoint of one who wants to judge of the net revenue-earning power of railroads it is fairer to include only revenue-earning freight.* The number of cars necessary to develop 1,000 tons of freight on a branch line is manifestly more than is required to haul 1,000 tons on the main line.

(d) Gross freight earnings.—This is based on revenue freight, and does not include company freight, and while it may well be taken as a measure of earning value, is it proper to take it as a measure for making a territorial distribution of moving assets?

The data necessary for the appraiser to secure in order to estimate and apportion the percentage under the first, third and fourth divisions is undeterminable from any source other than the records of the several railroad companies. The information necessary to compute the per-

*The *Railroad Gazette*, Nov. 3, 1899, page 762, third column.

centage under the second division is determinable, independent of the several railroad companies, and while it would be well to base the method of arriving at values for the purposes of taxation independently of the records of the railroad companies, it is conceded that the system of car accounting is generally uniform and accurate. While it is not practicable to keep the rolling stock constantly on the tracks of the company owning it it is, I believe, the desire of railroads in general to keep their cars in their own service, and so far as I have analyzed the results I find car mileage of cars owned is somewhat greater than foreign car mileage, and since a state is justly entitled to receive taxes on the floating property in proportion to the amount of business done by that property within the state it seems reasonable to consider car mileage of cars owned instead of all cars hauled.

The following methods is suggested for apportioning rolling stock:

Classify the rolling stock owned by each of the several railroad companies owning or operating railroads in the state of Michigan. Having appraised the value of the totals in each class the proportion to be allotted to Michigan will be in the ratio that the total mileage in Michigan for each class bears to the total mileage within and without the state for that class. In case the mileage for a division or main line, which is interstate or international, is not divided at the state line, then the mileage will be apportioned to the state in the same ratio that the miles of track on that division or main line lying without the state bears to the entire division or main line. For example: If the mileage of the Michigan Central main line between Detroit and Chicago is not divided at state line (New Buffalo) then the car mileage for Michigan for main line will be in the same proportion as the distance from Chicago to New Buffalo bears to the the distance between Chicago and Detroit. The railroads wholly within the state will of course need no apportionment, as all rolling stock owned by such roads will be appraised as if in Michigan. Many millions of car miles are made by private cars, such as Pullman cars, refrigerator cars, and some hundreds of others. These cars are not owned by railroad companies, but are the property of business corporations, firms or individuals, and I understand are taxed in state where general offices are located. Such cars are railroad equipment, but they are not railroad property. They float about the country like vehicles upon the public highway.

From the investor's point of view the value of a railroad property must necessarily be based upon its net earning capacity, or perhaps its value as a feeder to a trunk line. Its value is not necessarily increased by the construction of costly bridges, embankments, tunnels, terminals and the like, and in fact its value is more often diminished by the necessity of constructing expensive permanent way and terminals, and the most successful and valuable engineers are those who avoid the construction of costly works rather than those who build them. It cannot, therefore, I think, be conceded that we can determine the value of a railroad by summing up the cost of constructing the various individual parts that enable a railroad company to operate a continuous line It is contended by some that the property upon which terminals are constructed should be valued for the purpose of taxation, having in mind the railroad use of it. I am not at all sure that the terminals of a railroad are any more valuable than any other part, and indeed it may be held that in a given length of line between two large cities where there are expensive terminals one foot of track in the middle of its length is more valuable than either or both of its terminals, because without this one foot of track the railroad could not be operated as a whole, and consequently the terminals would not be available. Is it not a fact, therefore, that each foot of a given line of railroad between given terminals is of equal value for the purposes of a railroad? In the placing of bonds or other securities on a railroad property we do not generally select any fragment of the line but rather include a certain definite part which can be operated independently as a complete railroad. This may be only a division or a branch, but it is never a section of a division, branch or main line unless it be a terminal or property of some other part which is operated under separate corporation, or in conjunction with other railroads.

The state of Michigan now taxes railroads on their gross income. The accounting as now generally carried out by the several railroads is in accordance with the classification set forth by the Interstate Commerce Commission, and if this be followed the reports of the railroads will not, I think, show correct gross income. Take for example, car mileage: The Interstate Commerce Commission's Classification of Operating Expenses, page 21, account No. 33 Car-Mileage Balance is as follows: "This account represents the net balance paid to other companies, firms or individuals for use of cars interchanged on a car-mileage basis;" and in making annual reports to the Commission the railroads are instructed as follows: "Only the net balance of the car-mileage-balance account should be used without distinction as to passenger or freight equipment. If the result for both classes of equipment is a credit balance the amount should be reported under other earnings from operation. If the result is a debit balance, the amount should be reported as an expense under Conducting Transportation." While this method of accounting for net balances in car mileage may no doubt be considered as a proper one, it can hardly be held to indicate gross income, and since topography, geography, density of population, etc., all operate for or against the net earnings of a railroad, the relation that the gross earnings bear to the net earnings must necessarily vary, even though the executive ability exercised in the conduct of the company's business is the same in all cases. It would seem, therefore, that the value of a railroad might be determined more correctly by analyzing the auditor's accounts than by viewing the physical property, and if a uniform system of accounting is adopted by general consent or legislative enactment, it would be possible to determine the correct net earnings of each railroad by a critical examination of the company's books by inspectors appointed by the state.

The Tax Commission was also charged with the duty of making an estimate of the intangible value of railroad property. This branch of the subject was delegated to Prof. Henry C. Adams, Statistician of the Interstate Commerce Commission. The net result of Prof. Adam's calculations, as explained to the Tax Commissioners, is that he proposes to take the net earnings, after explaining how he determines them, and having capitalized these net earnings, add this amount to the cost per mile as determined by the results of Prof. Cooley's investigation. The result would be that in case the present value per mile as determined by Prof. Cooley is found to be $15,000, and the net earnings by Prof. Adams are found to be $1,000, this capitalized at 5 per cent. would equal $20,000, and added to the present value would make $35,000, which would be the sum upon which taxes were to be levied. In other words, if the company actually earns $1,000 it increases its value for purposes of taxation 20 times that amount. If, however, instead of having a net earning of $1,000 it spends that sum in improving the property, it has only increased its taxable property by $1,000. The difficulties attendant upon determining the intangible value of a railroad property seem to be even greater than it is to determine the present value from a calculation of what it has cost to replace the several parts which go to make up the entire railroad.

The Lake Shore & Michigan Southern operating in several states finds that although an entirely different system of valuation and assessment is followed in each of the several states the total amount of taxes paid per miles is almost identically the same in all the states. In Illinois the permanent way is held to be real estate and is taxable in the several districts in the proportion that the length of the main track in such district bears to the whole length of the track in the state. The rolling stock, although valued separately, is apportioned in the same manner. In Indiana the classification under the head of railroad track, rolling stock, personal property and real estate is taxable in the main the same as in Illinois. In New York, in addition to real estate, personal property and corporate stock of each railroad an annual excise tax or license tax and a special franchise tax are imposed on each railroad company. In Ohio all railroad property used in the actual operation of the company is treated as personal property, and the proportionate value thereof is taxed in each county in or through which the road extends the same as other property. In Pennsylvania every railroad company, as well as each canal, pipe line, steamboat, transportation, slack water, street railway, telephone, telegraph, express, electric light and palace and sleeping car company is required to pay a tax of 8 mills on the dollar on its gross receipts within the state, also an annual tax of 5 mills on the dollar on its capital stock.

Since the capital stock of a large number of the railroads in Michigan is not listed, no accurate valuation could be based upon capitalization, and since the physical cost of a railroad is in no wise a measure of its value, it does not seem proper to attempt to determine its value on the basis of cost of construction. The value of a railroad seems to be determinable only by its earning power, and if a proper system of determining this earning power is put in force, it would seem to solve the problem of the value of a railroad for the purpose of taxation, and it is not unlikely that when such a system is properly worked out it will be adopted by all the states.

The railroads as common carriers must continue to operate even though the earnings are not sufficient to pay operating expenses, for any failure to operate may involve the loss of charter. The police regulations attendant upon the operation of a railroad are also different than for other corporations, and in fact the owners of a railroad may not remove its tracks without legislative consent. We cannot therefore measure the value of a railroad for the purpose of taxation with the same unit as used for private business.

TECHNICAL.

Manufacturing and Business.

The Chicago Pneumatic Tool Co., Chicago, is bringing out a flat piston air drill, which is said to have distinct features of merit. The air consumption is small for the power developed, and the few parts required in the flat piston type lessen weight, vibration and repairs.

Universal car bearings are specified for the 50 cars ordered by the Elgin, Joliet & Eastern from the American Car & Foundry Co.

The St. Louis office of the Bethlehem Steel Co. has been moved to 510 Security Building. S. E. Freeman will continue as representative.

Improved "Michigan" triple lubricators will be used on the two 10-wheel locomotives which the California & Northwestern has ordered from the Richmond Locomotive Works as noted last week.

The Philadelphia Pneumatic Tool Co., which recently enlarged its factory at Ridge avenue, Eleventh and Noble streets, Philadelphia, Pa., has moved its offices to the factory building. The new address is 1038 Ridge avenue.

Westinghouse, Church, Kerr & Co. have received the contract from the Scranton & Wilkesbarre Rapid Transit Company of Scranton for the entire equipment of the road above the rails for $1,200,000. The contract includes the motors, cars, engines and generators and the powerhouse complete.

The entire capital stock, factory, and real estate of the Duff Manufacturing Co., of Allegheny City, Pa., has been purchased by J. R. McGinley, of Pittsburgh, Pa. The Duff Manufacturing Co. manufactures the well-known Barrett automatic lever jack. Mr. McGinely has for about 20 years been identified with the Westinghouse interests, and will take personal charge of the management of the Duff Company. He will make improvements in the factory to greatly increase the capacity, and is about to conclude arrangements for the sale of the company's product in foreign countries.

The fire in the works of the B. F. Sturtevant Co., at Jamaica Plain, Mass., April 14, proved to be far less disastrous than was first reported. Only the engine and electrical departments were injured. The power plant was started up with but a single day's delay, incident to renewing belts damaged by fire, and the entire blower, heater, forge, galvanized iron and shipping departments with the foundry, pattern shop, etc., were working to full capacity on that day and the shipments going forward as usual. No valuable office records were lost. Fortunately, an entirely new general catalogue was in press at the time and copies were issued on the 16th. On Monday noon the business was running as usual.

The Bullock Electric Mfg. Co., Cincinnati, Ohio, and the Wagner Electric Mfg. Co., St. Louis, Mo., have combined their selling organizations. The product of the Bullock Co. consists of a complete line of direct and alternating current machines, from a ½-h.p. motor to a 10,000-k.w. generator; controllers of various types and rotary transformers. The product of the Wagner Co. covers a full line of static transformers of all types and of the largest sizes; ammeters, voltmeters, indicating wattmeters, switches, switchboards for all purposes and single-phase self-starting alternating current motors. The entire absence of complicated starting mechanism especially adapts the Wagner single-phase motor to pumping plants and machinery of like character. The sales department will be under the management of Mr. E. H. Abadie, formerly Sales Manager of the Wagner Company.

The Bullock Electric Mfg. Co. has acquired control of 15 acres of land directly opposite the present plant at East Norwood, Ohio. Upon this tract the Norwood Foundry Co. will erect a foundry building 200 ft. long x 150 ft. wide; a pattern storage house of fire-proof construction, 50 x 150 ft., three stories high; and a modern office structure. All these buildings will be built of buff pressed brick with steel frames and trusses to conform to the present buildings of the Bullock Electric Mfg. Co. The foundry will be equipped with three electric cranes, the largest of which will have a capacity of 50 tons. The side bays, which will be 25 ft. wide, will be served by hand traveling and jib cranes. While this foundry will be operated under the name of the Norwood Foundry Company, it will serve primarily the needs of the Bullock Electric Mfg. Co. It will also be in position to handle outside orders.

Iron and Steel.

The Tennessee Coal, Iron & Railroad Co., according to report, expects to have its new mill at Ensley, Ala., ready to roll rails in July.

D. J. McKenzie, Assistant Superintendent of the Dominion Iron & Steel Company's piers, was killed at Sydney April 13 by falling from a pier.

The Navy Department on April 10 awarded the contract for building the protective cruiser "Milwaukee" to the Union Iron Works of San Francisco at $2,825,000.

The National Steel Rolling Mill Co., with a capital of $50,000, was incorporated in Indiana last week by E. B. Mitchell, of Lima, Ohio, and J. H. Jones, of Muncie, Ind. Mr. Mitchell is President.

Edwin Ball, heretofore General Manager of the Minnesota Iron Co., has been selected Manager of all the iron mines of the Tennessee Coal, Iron & Railroad Co., with headquarters at Birmingham, Ala., after May 1.

Jones & Laughlins, Limited, of Pittsburgh, have a Japanese contract which calls for about 4,300 tons of structural material, to be used in building a pier at Osaka. The contract is valued at upwards of $200,000. The work will be completed in about six months.

New York State Canals.

The confident prediction now from Albany is that the bill to submit to the vote of the people next fall the question of spending $26,000,000 on improvements of the canals of the state of New York will not be passed this session.

Car Lighting.

On 32 passenger cars, contracts for which have been placed by the Atchison, Topeka & Santa Fe, the Pintsch gas lighting system is specified. When these cars are in service the Atchison will have 106 passenger equipment cars fitted with Pintsch gas. As the Atchison has experimented with electric lighting more extensively than any other railroad in the country the specifying of gas for these new cars is thought to have unusual significance.

Rails from the Sault Ste. Marie.

In a Parliamentary debate at Ottawa the other day the fact was brought out that a contract had been made to supply 25,000 tons, within the next year, of rails for the Intercolonial Railway, this contract having been made with Mr. F. H. Clergue's steel company, at the Sault Ste. Marie. Delivery is to begin the first week in August, and to be made at the rate of 500 tons a day. The rails are to be 80 lbs. per yard, and the contract price is $32.60 per ton. In making the announcement to the House it was said that the company lays great stress on the fact that their ore contains a certain percentage of nickel, which will add to the value of the rails.

Locks and Dams.

Bids are wanted until May 9 for building lock and dam No. 9 in the Kentucky River. Address Captain H. F. Hodges, Corps of Engineers, U. S. A., Cincinnati, Ohio.

Baker & Judson, of Gloversville, N. Y., are said to have the contract for building four locks in the Monongahela River at Morgantown, W. Va., at $487,000.

Sealed proposals for the completion of the masonry dam at the Wigwam Reservoir will be received by the Board of Public Works, Waterbury, Conn., until 4 p. m., April 30. Contract, specifications and plans may be seen at the office of R. A. Cairns, City Engineer, No. 9 Leavenworth street, Waterbury. The chief item of work involved is the laying in portland cement mortar, of about 4,000 yds. of first-class masonry, of which about one-third is granite ashlar facing.

Changes in the National Tube Co.

E. C. Converse has resigned as President of the National Tube Co. to assume his duties as a Member of the Executive Committee of the United States Steel Corporation. Mr. Converse is succeeded by F. J. Hearne, of Pittsburgh, formerly First Vice-President of the company. Wm. B. Schiller, formerly Assistant First Vice-President, succeeds Mr. Hearne. William H. Latshaw, formerly Third Vice-President, was elected Second Vice-President, in place of F. L. Potts, resigned. John D. Culbertson was elected Third Vice-President to succeed W. H. Latshaw. A. S. Matheson, formerly General Manager, was elected Fourth Vice-President. John D. Culbertson was elected Treasurer, vice Arthur F. Luke, resigned to become Treasurer of the U. S. Steel Corporation. The offices of the President, Secretary and Treasurer of the National Tube Co., in New York, will be removed to Pittsburgh.

The Pennsylvania Steel Company.

The Pennsylvania Steel Co., by a unanimous vote of the stockholders on April 10, accepted the proposition of John Lowber Welsh to pay $5,000,000 for all the property and assets of the Steel Company, he agreeing to take over all such property and assets, subject to the payment of all indebtedness, preparatory to reorganization.

The reorganization plan to provide additional capital and for the retirement of a portion of its bonded debt contemplates an increase of capital from $6,500,000 to $50,000,000. There will be a new Pennsylvania steel corporation, to acquire all the property of the Pennsylvania and Maryland Steel Companies. It is proposed to issue $16,500,000 preferred shares and $10,750,000 common shares, for which the properties will be conveyed or the control transferred to the new company, subject to the existing bonded debt; and $9,000,000 in cash will be paid into the treasury of the new company. Shareholders will deposit their shares with the Girard Trust Company. The purchase of the Spanish-American Iron Company's mines in Cuba was a part of the general plan, and was made with the expectation that the reorganization would be ratified.

THE SCRAP HEAP.

Notes.

The Legislature of Texas has passed a law imposing imprisonment and a heavy fine on lawyers who foment damage suits against railroads, or who advance money to clients for the purpose of promoting such suits.

The Supreme Court of New York has granted a permanent injunction against the Grade Crossing Commission of Buffalo, restraining that body from requiring the elevation of the tracks of the Lehigh Valley road. The ground for the injunction appears to be that the radical change of grade which is proposed would greatly damage the freight business of the road.

It is announced that the Northern Pacific has leased eight steamships, varying from 4,000 to 10,500 tons, to be run between Tacoma and Liverpool by way of the Suez Canal. It is proposed to establish a line, the vessels to call at Yokohama, Kobe, Nagasaki, Shanghai, Hong Kong, Manila, Singapore, Colombo and Aden. The first steamer will sail from Tacoma in May. It will be remembered that a vessel made a trip over this route a few months ago, expecting to find fuel expenses less than by the Cape Horn route, on account of the greater facilities for getting cheap coal.

Traffic Notes.

The State Railroad Commissioner of Michigan has ordered the Grand Rapids & Indiana to reduce its passenger fares to 2½ cents a mile, the passenger earnings for the last year having increased to $2,000 a mile.

Chicago newspapers report that the roads west of that city have made careful and extended inquiries in Europe concerning immigration, and as a result expect more emigrants from Europe in 1901 than in any previous year.

A press despatch from Cleveland says that the owners of practically all the lake vessels carrying bulk freight, except lumber, and except those owned by the United States Steel Corporation, have agreed to pool their earnings during the coming season. Apparently, the details of the plan are yet to be agreed upon.

The South Carolina & Georgia has won a suit against a ticket scalper who persisted in riding on trains and purchasing from the passengers the return portions of excursion tickets. The scalper, Henry Caspary, was ejected from a train, and sued the company for $20,000; but the Court decides that the ejectment was lawful.

The Louisville & Nashville has established dining car service on its line between Birmingham and New Orleans, the cars being run on the trains which run through to and from Chicago in connection with the Chicago & Eastern Illinois via Evansville, and in connection with the trains to and from Cincinnati. Breakfast and luncheon are served by the card, but in the evening table d'hote dinner is served. This, we believe, is the first dining car service ever provided by the L. & N.

In the United States Circuit Court at Pittsburgh, Pa., April 12, 37 suits were filed against the Pennsylvania and a number of other Eastern roads by the Independent Refining Company and other oil shippers to recover $125,000 for alleged overcharges, the different claims ranging from $200 to $8,600. These claims, about seven years old, have already been adjudicated by the Interstate Commerce Commission, and decisions given in favor of the plaintiffs, but the railroads have not complied with the orders.

The Supreme Court of California has decided in favor of the Southern Pacific in a suit brought by the road to restrain W. H. Robinson, John Doe and 18 others from prosescuting 500 suits which they have brought to recover penalties of $200 each against the road for refusing to allow these men to stop over on local tickets. It appears that these men have brought, or have prepared to bring, 3,000 suits against the company in the hope of recovering $600,000 in penalties, but the court decides that, as averred by the railroad, these men did not desire to stop over, but simply desired to have the railroad refuse them the privilege. In 20 of the 2,000 cases there was some evidence that the passengers did want to stop over for a legitimate purpose, but in view of the general evidence of their purpose the judges say that it is entirely justifiable to put these 20 refusals in a common receptacle with the other 2,980.

Progress of Manchurian Railroad.

Under date of Moscow, March 11, 1901, Consul Smith reports as follows: "I am informed from reliable sources that the rails have been laid on the division Hailar-Zizikar, of the Manchurian Railway, and the remaining two-thirds of the whole line between Tchita and Vladivostock is nearly completed. On the divisions Tchita-Kaidalovo-Hailar and Vladivostock-Nikolsk-Harbeen-Zizikar, working trains are running already, and the whole line, it is supposed, will be opened for passenger traffic by May of the current year."

Technical Schools.

University of Illinois.—Students of the University of Illinois are now making evaporation tests of locomotive boilers at the Centralia shops of the Illinois Central. The dynamometer car owned jointly by the University and the Illinois Central will be used this spring in road tests of locomotives.

Purdue University.—Mr. L. E. Johnson, General Manager of the Norfolk & Western Railway, delivered an address before the engineering students of Purdue University, April 8. In deference to the specific request of the University authorities, Mr. Johnson spoke upon "The Duties of a General Manager." After describing somewhat briefly the organization of a railroad he discussed more in detail the character of the business which reaches the office of a general manager. He incited some amusement by relating incidents arising in connection with claims, and then by exposing the record of a single day's work, convinced his student audience that the office of a general manager was no sinecure.

Announcement is made that Mr. William Kent will deliver a lecture before the students of Purdue University each day throughout the week beginning April 15. He will speak to Civil, Mechanical and Electrical Engineers and will choose for his subjects various topics drawn from his engineering experience. Mr. Kent has frequently given individual lectures before the students of technical schools, but has not before undertaken a series extending over a considerable time.

Strikes.

The boiler makers of the New Haven road at New Haven, about 50 of them, struck on April 16 because their hours of labor had been lengthened without an increase of pay. Several hundred machinists in the shops of the Central of New Jersey at Ashley, Pa., struck on April 12, their grievance being the dismissal of 30 other men from the shops. It is said that the company settled the strike by agreeing to take back the 30 men who had been dismissed. On April 16 the switchmen of the Lackawanna road at Scranton and Clark's Summit struck because the Yardmaster had discharged two men.

The talk of a general strike on the Central of New Jersey, which has filled the newspapers for two or three weeks past, appears to have been magnified by the reporters. The chiefs of the several brotherhoods visited New York to confer with the officers of the railroad, but the return of most or all of these leaders to their homes before a settlement was reached appears to indicate that the alleged grievances were not so great as had been reported. On Saturday last it was given out that the enginemen and firemen had had their wants satisfied, though not until after compromise on a number of points; but on the same day Mr. Arthur, in an interview at Cleveland, said, according to report, that the enginemen and firemen could not honorably settle with the company until the trainmen and telegraph operators were also satisfied, as the five principal oraganizations had agreed to work together. From the published accounts it appears that enginemen will receive about 2o cents more per 100 miles than heretofore, and the firemen will have a new schedule, under which some of the men receive more and some less. The officers of the company say that the terms now granted are the same as those offered by the company last December and not accepted. The total increase in the pay-rolls throughout the company's lines will be about $35,000.

LOCOMOTIVE BUILDING.

The American Machinery & Export Co., 15 Cortlandt street, New York City, is in the market for two passenger and eight freight locomotives for South America.

The Southern order for locomotives with the Baldwin Locomotive Works, referred to March 15, calls for 10 10-wheel passenger and 25 consolidation freight engines, for October and November delivery. The former will weigh 154,000 lbs., with 115,000 lbs. on the driving wheels and have 20-in. x 26-in. cylinders; 70-in. driving wheels; radial stay boilers with a working steam pressure of 200 lbs. and 298 National charcoal iron tubes 2 in. in diam. and 14 ft. 5¼ in. long; fire-boxes, Carbon steel, 108 in. long and 41⅞ in. wide; grate area, 32 sq. ft. and tender capacity 5,000 gals. of water and from 8 to 10 tons of coal. The freight engines will weigh 151,500 lbs., with 133,600 lbs. on the driving wheels and have 21-in. x 28-in. cylinders; 60-in. driving wheels; radial stay boilers with a working steam pressure of 200 lbs. and 271 National charcoal iron tubes 2 in. in diam. and 14 ft. 8 in. long; fire-boxes, Carbon steel, 102¾ in. long and 41⅞ in. wide; grate area, 30 sq. ft. and tender capacity 5,000 gals. of water and from 8 to 10 tons of coal. The specifications for both types call for Westinghouse brakes, Magnesia boiler lagging, Sterlingworth brake-beams, Nathan injectors, U. S. Metallic piston and valve rod packings, Coale safety valves, Leach sanding devices, Nathan lubricators, Scott springs, Crosby thermostatic steam gages and Latrobe wheels. The passenger engines will have Pyle-National electric headlights.

CAR BUILDING.

The Pere Marquette is in the market for 800 cars.

The Solvay Process Co. has ordered 13 cars from the Russell Wheel & Foundry Co.

The Tacoma Eastern has ordered 25 flat cars from the American Car & Foundry Co.

The Morenci Southern has ordered six hopper cars from the American Car & Foundry Co.

The Missouri, Kansas & Texas has ordered 30 passenger cars from the American Car & Foundry Co.

The American Car & Foundry Co. has received orders from individual concerns aggregating 327 freight cars.

The Escanaba & Lake Superior is reported to have ordered 50 ore cars from the American Car & Foundry Company.

The Middletown Car Works have received an additional order from Argentine for 35 dump cars, with steel underframes and wooden steel-lined bodies.

The Colorado Midland has ordered the 100 coal cars of 80,000 lbs. capacity and 100 box cars of 60,000 lbs. capacity, referred to March 8, from the American Car & Foundry Co.

The Geiser Mfg. Co. is having six platform cars, 60 ft. long, built by the Middletown Car Works. They will be equipped with M. C. B. couplers, Westinghouse brakes and metal brake-beams.

The Atchison, Topeka & Santa Fe has ordered 15 wide vestibule chair cars from the Barney & Smith Car Co. The dimensions and specifications will be the same as for cars ordered from the Pullman Co. and referred to last week.

The Colorado Midland (a new road in Arizona) order with the Pullman Co., mentioned in our issue of April 5, calls for five wide vestibule chair cars for September delivery. The specifications include Janney couplers, Pintsch light and Standard steel platforms.

The St. Louis & San Francisco has ordered from the American Car & Foundry Co., in addition to the 500 box cars referred to Feb. 8, 100 furniture, 300 coal and 10 caboose cars. In our issue of March 29 we referred to an order with the same works for nine cars for passenger service. The total order for this equipment calls for 10 coaches and four baggage cars.

The Southern orders for cars placed this month were referred to in our issues of April 5 and 12. The following are abstracts from specifications: One hundred furniture cars, American Car & Foundry Co., 60,000 lbs. capacity, July delivery, 50 ft. long, 8 ft. 6 in. wide, 8 ft. 7 in. high, Pressed Steel bolsters, Janney couplers, Jones door fixtures; 50 side-dump ballast cars, American Car & Foundry Co., 80,000 lbs. capacity, May delivery, 31 ft. 8 in. long, 9 ft. 1 in. wide, 5 ft. high inside, Shickle, Harrison & Howard steel bolsters, Tower couplers, Shickle, Harrison & Howard (Ajax) trucks; 500 box cars, American Car & Foundry Co., July delivery, and 400 box cars, Mt. Vernon Car Mfg. Co., September delivery, all of 60,000 lbs. capacity and 40 ft. long, 8 ft. 2¼ in. wide and 7 ft. 1¾ in. high inside, Pressed Steel bolsters on the former and Simplex bolsters on the latter, Janney couplers, Jones door fixtures, Chicago-Cleveland roofs; 600 ventilated box cars, Mt. Vernon Car Mfg. Co., 60,000 lbs. capacity, September delivery, 40 ft. long, 8 ft. 2¼ in. wide and 7 ft. 1¾ in. high inside, Simplex bolsters, Janney couplers, Jones door fixtures and Chicago-Cleveland roofs; 1,000 double hopper coal cars, Southern Car & Foundry Co., 80,000 lbs. capacity, June to September delivery, 32 ft. long, 7 ft. 9 in. wide and 6 ft. high, in clear, Sterlingworth bolsters, Tower couplers and Sterlingworth trucks; 50 refrigerator cars, Southern Car & Foundry Co., 60,000 lbs. capacity, June to September delivery, 37 ft. long inside, 8 ft. 2¼ in. wide and 7 ft. 6 in. high, inside, Pressed Steel bolsters, Janney couplers; 100 coke cars, Southern Car & Foundry Co., 60,000 lbs. capacity, June to September delivery, 38 ft. long, 8 ft. 2 in. wide and 7 ft. 2¼ in. high inside, Pressed steel bolsters and Janney couplers; 100 stock cars, Southern Car & Foundry Co., 60,000 lbs. capacity, June to September delivery, 40 ft. long, 8 ft. 2 in. wide, 7 ft. 2¼ in. high, inside, Pressed Steel bolsters and Janney couplers; 100 flat cars, Georgia Car & Mfg. Co., 60,000 lbs. capacity, September delivery, 40 ft. long over end sills and 9 ft. wide over floor, Bettendorf bolsters and Janney couplers. All the freight cars will have Sterlingworth brake-beams, Westinghouse brakes, Thornburg draft rigging, American dust guards, cast-iron journal boxes with pressed steel lids, Scott springs and Southern Ry. standard brasses and paint. Fifteen passenger coaches, the Pullman Co., for September and October delivery, 64 ft. long over all, 9 ft. 8½ in. wide outside of side sills and 9 ft. 5½ in. from top of floor to center of ceiling, seven of the cars will have narrow and eight wide vestibules; 15 passenger coaches, Barney & Smith Car Co., August and September delivery, same dimensions as cars with the Pullman Co.; five passenger and baggage cars, Barney & Smith Car Co., August and September delivery, 65 ft. long over end sills, other dimensions same as previous cars; one baggage and express car, American Car & Foundry Co., August delivery, 64 ft. 8¾ in. long over all, 9 ft. 8½ in. wide and 9 ft. 5 in. high; five mail and baggage cars, American Car & Foundry Co., August and September delivery, 59 ft. 8¾ in. long over all, 9 ft. 8½ in. wide and 9 ft. 5¼ in. high; two passenger, baggage and mail cars, American Car & Foundry Co., August and September delivery, 50 ft. 11¼ in. long, 9 ft. 8½ in. wide and 9 ft. 5⅞ in. high; all the cars for passenger service

will have Sterlingworth brake-beams, Westinghouse brakes, three-stem Buhoup couplers, American dust guards, Gold steam heat system, Pintsch gas, Standard steel platforms, Scott springs and steel-tired wheels. The passenger coaches will have Forsyth curtain fixtures with Pantasote curtains.

BRIDGE BUILDING.

Altoona, Pa.—Harvey Linton, City Engineer, informs us that the bridge proposed over the Pennsylvania R. R., near Eleventh street, will be of steel, about 460 ft. long, consisting of three spans, but no estimate of the cost has been made.

Bakersfield, Cal.—The Mountain Valley & Bakersfield R. R. is reported to have decided upon a location for a bridge over Kern River.

Beaverton, Ont.—A $10,000 drawbridge is proposed over Tread Canal near Lake Simcoe. Richard B. Rogers, Chief Engineer, Peterborough, Ont.

Boston, Mass.—City Engineer William Jackson estimates that the cost of widening and rebuilding the North Haven street bridge will be $26,290, and that the cost of building a highway bridge between Holyoke and Garrison streets will be about $30,500.

Buffalo, N. Y.—The Park Board opened nine bids, April 10, for a bridge at South Side Parkway over the tracks of the Buffalo, Rochester & Pittsburg Railroad. The lowest bid of $18,800 was by Frank J. Reap, of Rochester, to whom the contract was let.

Central Lake, Mich.—The Governor has signed the bill authorizing Central Lake to issue $15,000 bonds for roads and bridges.

Chicago, Ill.—The town of Calumet has voted to issue bonds for a steel bridge across the Calumet River which is to cost about $11,000. The county will pay part of the cost.

Clarksdale, Miss.—The Board of Supervisors of Coahoma county, Miss., want bids, until June 3, for a steel bridge across Sunflower River.

Cross Creek, Ohio.—The Pittsburgh & Carnegie R. R. will cross the Ohio River by a bridge near Cross Creek. (See also Pittsburgh, Pa., below.)

Des Moines, Iowa.—The Lassig Bridge & Iron Works, of Chicago, has a contract from the Chicago, Rock Island & Pacific to replace the old bridge on Market street. The work of construction is to commence at once. The contract price is about $25,000.

Dublin, Ga.—A committee has been appointed to receive plans and specifications for the proposed extension to the Oconee River bridge. The extension will be about 1,100 ft. long and it is said the contract will be let in 60 days.

Du Boistown, Pa.—Viewers have reported favorably for a steel bridge between Newberry and Du Boistown, to be about 1,300 ft. long and cost about $90,000.

Ellicott City, Md.—The committee appointed by Howard County to select a site for the Avalon bridge over Patapsco River has made its report. Plans will soon be ordered.

East Northfield, Mass.—A bridge is proposed over the Connecticut River about half a mile above the present wooden structure, at a cost of about $35,000.

Gaffney, S. C.—The Cherokee County Commissioners will receive plans and specifications until April 24 for a bridge and approaches across Broad River to be of three spans 150 ft. each. W. H. Ross, Clerk of Board.

Gradton, N. D.—Bids are wanted, May 8, for iron and steel bridges. O. M. Fraser, County Auditor.

Gurley, Ala.—The Commissioners of Madison and Marshall counties have decided to build a steel drawbridge over Paint Rock River at Gurley. The contract will be awarded by the Madison County Commissioners.

Indianapolis, Ind.—According to report, the Chicago, Indianapolis & Louisville will replace its wooden bridges with steel structures on stone foundations.

Lewisburg, Pa.—The Commissioners of the County of Union will receive proposals, on April 27, for the masonry of a County bridge to be built over Sweitzer Run, in Limestone Township; also for the masonry of a County bridge over the Head Race. A. A. Gemberling, Commissioner.

Los Angeles, Cal.—The Santa Fe Pacific has let a contract to the American Bridge Co. for a steel bridge over the Los Angeles River at $114,000.

Marietta, Ohio.—We are told that the Ohio River Bridge & Ferry Co. has been incorporated to build the railroad bridge between Marietta, Ohio, and Williamstown, W. Va. The plans have been approved by the War Department and the contract is let for the foundation to the piers. The contracts for the piers or the superstructure have not yet been let. The bridge, including the approaches, will be about 7,800 ft. long. The two river spans will be 650 and 600 ft. respectively and will be 93 ft. high. The contract for the piers may be let within 30 days and the company expects to have them finished ready for the superstructure in the fall. Beman G. Dawes is President and Manager, with office at Marietta.

Nashville, Tenn.—Bids will be received, April 27, for a steel bridge across Hamilton's Creek, in the Third District of Davidson County. The plans and specifications may be seen at the office of the County Judge, at the courthouse. C. B. Harwood, R. T. Moore, B. F. Williams, Committee.

Newport, Ky.—Proposals will be received at the office of the County Judge in Newport, until April 20, by the County Judge and County Surveyor, for an iron span over Ten-Mile Creek, near the Chesapeake & Ohio R. R. Length of span, 50 ft.; width of roadway, 12 ft.; bridge to have iron substructure tubes probably 30 or 40 ft. high. Address E. E. Ball, Engineer, California, Ky.

New York, N. Y.—A bill has been introduced in the Legislature providing for a bridge over Newtown Creek from Franklin street, Brooklyn, to Front street, Queens.

A bill has been introduced in the Legislature providing for a new terminal at the Manhattan end of the New York and Brooklyn Bridge. The Bridge Commissioner is authorized to make plans, etc., for a loop for over Park Row.

Pittsburgh, Pa.—The plans for the bridge over the Monongahela River for the Pittsburgh & Carnegie Railroad, referred to on another page of this issue, are being made by Bollar & Hodge, New York. It will be a single span of 800 ft. and 80 ft. high. (See also Cross Creek, Ohio.)

Port Chester, N. Y.—At a meeting held in Greenwich, Conn., April 16, it was decided to build a new steel bridge, 50 ft. wide, over the Byram River, the dividing line between New York and Connecticut. It will cost $11,000. The expense is to be borne by Greenwich, Westchester County, N. Y., and the trolley company in whose interest the bridge is to be built.

Rat Portage, Ont.—The town has asked the Provincial Government for assistance in building a steel bridge over the East Branch of the Winnipeg River at Rat Portage. Thomas D. Deacon made the estimates for the council.

Richmond, Que.—The large iron bridge over the St. Francis River at this place, which was carried away by the flood, will be rebuilt at once.

San Mateo, Cal.—D. Bromfield has been engaged by the Board of Trustees to make plans, specifications, etc., for four steel bridges for this city. R. H. Jury, City Clerk.

Santiago de Cuba.—The King Bridge Co., of Cleveland, Ohio, has secured a contract for five bridges for the United States Government at Santiago de Cuba.

Sauk Center, Minn.—Bids are wanted, April 24, for a 125-ft. iron bridge over Sauk River. P. J. Gruber, County Auditor, St. Cloud, Minn.

South Bend, Ind.—The Commissioners of St. Joseph County are considering building a 100-ft. bridge at Bowman's Creek.

Spencerville, Ind.—We are told that six bridges of a total length of 540 ft., will be needed on the extension of the Wabash between New Haven, Ind., and Butler. The largest bridge will be over the St. Joseph River near Spencerville.

Springfield, Mass.—The City Engineer is making plans for the abolition of the grade crossing at the south end of the new bridge to be built over the Connecticut River. It is proposed to have Pecowsic avenue pass under the tracks of the Consolidated Road.

Springfield, Ohio.—See Other Structures.

Steubenville, Ohio.—The Pan-Handle bridge over the Ohio River at Steubenville is to be realtered by removing the shore pier, making one span instead of two, and giving the channel a clear space of 500 ft. instead of 300.

Tampico, Ill.—Major J. S. Willard, Corps of Engineers, U. S. A., wants bids, on May 4, at his office, 1637 Indiana avenue, Chicago, for a single track railroad bridge over the Illinois & Mississippi Canal at Tampico.

Terrebonne, Que.—The old wooden bridge, which was destroyed by floods recently, will be replaced by a steel structure by Estate Masson of this place.

Terre Haute, Ind.—James Soules, Auditor of Vigo County, informs us that the bridge proposed over the Wabash River in Terre Haute will be about 600 ft. long and cost about $75,000, but the plans have not been decided upon.

Topeka, Kan.—James P. Rogers, County Engineer, tells us that the time for letting the contracts for the four steel bridges to be built over the Kansas River has been changed to April 30. Plans and specifications are on file at his office in Topeka. The appropriation for the four bridges is $80,000. (April 5, p. 244.)

Vidalia, La.—Sealed bids will be received by the Police Jury of Concordia Parish, La., at the courthouse in said parish, on May 8, for building three steel bridges; one at Cross Bayou, one at Cocodra Bayou, and one at Buckner Bayou. Plans and specifications of L. M. Dalgarn, Natchez, Miss., have been adopted. James P. Fagan, President; John Dale, Clerk.

Washburn, Me.—The town has voted to issue bonds for a steel bridge over the Aroostook River which is to cost about $10,000. The structure will probably be of three 160-ft. spans, lattice truss. Turner Wilder is a member of the bridge committee.

Washington, D. C.—Borings are being made in the Potomac River above the Long Bridge to find the best location for the new highway bridge. On the site of the proposed Memorial bridge borings showed rock 36 ft. below mean low water in the middle of the channel and 20 ft. at the shore line.

Westbrook, Me.—The bridge of the Westbrook, Windham & Naples Electric road, over the Presumpscott River, about three miles above this city, was carried away on April 7.

Other Structures.

Cleveland, Ohio.—The Wellman-Seaver Engineering Co., of Cleveland, has bought a new site on the Cleveland & Pittsburgh R. R., for a new plant. The new machine shop will be about 570 x 128 ft.; blacksmith shop, 100 x 100 ft.; pattern making and storage shop and a boiler and power house each about 70 x 58 ft. Later an iron foundry will be built.

Cordova, Pa.—The Pennsylvania has plans ready for a passenger station at Cordova.

Duluth, Minn.—The Northern Pacific will build a 32-stall roundhouse here.

East Norwood, Ohio.—The Bullock Electric Mfg. Co. will build a new foundry here, as mentioned in another column.

East St. Louis, Ill.—The Southern is reported to have let a contract for a 1,000,000 bushel grain elevator at East St. Louis.

Newark, N. J.—According to report, the Pennsylvania R. R. is getting plans ready for a new station in Newark in connection with the elevation of tracks.

New Decatur, Ala.—The Louisville & Nashville is reported considering building a new station between the two Decaturs.

New York, N. Y.—The Erie R. R. has bought land between Eleventh and Thirteenth avenues and Twenty-eighth and Twenty-ninth streets for a freight depot.

Okoboji, Iowa.—The Chicago, Milwaukee & St. Paul will build a dock at Lake Okoboji in Dickinson County, Iowa. The dock will be 150 ft. long. A pavilion to cost $10,000, with a floor for dancing, a stage and audience room with a seating capacity for 3,000, and a restaurant, will be built near the dock.

Philadelphia, Pa.—The Philadelphia & Reading has plans made for a six-story warehouse and grain elevator at Port Richmond. The structure will front about 150 ft. on Richmond street and 97 ft. on William street. It will be of brick, iron and stone.

St. Joseph, Ind.—The Wabash R. R. will build a station at this place; also at Spencerville, Ind., on the extension referred to in another column.

Springfield, Ohio.—The Big Four is reported considering plans for a new passenger and freight station in Springfield. The work will probably necessitate a viaduct over Spring street.

Walkerville, Ont.—We are told that the Lake Erie & Detroit River R. R. is considering sites for new workshops, and that they may be located at Chatham, Blenheim or Walkerville.

Wilmington, Del.—The Philadelphia & Reading has let a contract to N. Smith Barklay, of Wilmington, for the new passenger station to be located at King and William streets. It is to be two stories high and of brick. The upper story will be used for local offices.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xviii.)

New York Railroad Club.

A regular meeting of the Club was held at No. 12 West Thirty-first street, New York, at 8 p. m., Thursday of this week. The paper of the evening was by Mr. Chas. W. Buchholz, Chief Engineer Erie Railroad, and entitled "The problem of providing an all-rail connection across the Hudson River, between the City of New York and the railroads terminating on the Jersey shore."

Engineers' Club of St. Louis.

The 524th meeting was held at 1600 Locust street, April 3, 1901, Vice-President Kinealy presiding. The subject of the evening was a paper by Mr. Louis Bendit entitled "Treatment of Feed Water for Boilers." Mr. Bendit paid particular attention to the various methods of treating hard waters for use in boilers, and presented considerable data upon the same. Discussion was participated in by Messrs. Wheeler, Bryan, Freeman and Prof. Keiser, Professor of Chemistry at Washington University.

Western Society of Engineers.

The Western Society of Engineers has issued a schedule of papers to be presented at the meetings between April 17 and June 26 inclusive, which is as follows:

April 17.—S. B. Newberry, Sandusky, Ohio, "The Manufacture and Testing of Hydraulic Cements"; G. A. M. Liljencrantz, F. L. Hill and others, "Discussion of Bascule Bridges," illustrated.

May 1.—A. Bennett, "A Simple Method of Determining the Conditions of Combustion, with Suggestions on Working Furnaces"; L. P. Breckenridge, "Boiler Tests with Illinois Coals," illustrated; G. S. Morison, "Effects of Splicing and Riveting."

May 8.—A. V. Abbott, Chief Engineer Chicago Telephone Company, "Experiments with High Frequency Electrical Oscillations," illustrated with apparatus.

May 15.—R. C. Sattley, "A Central Terminal Station for Chicago"; J. H. Spengler, "The Water Works System of Chicago," illustrated.

June 5.—James Macdonald, "Fireproof Elevator Construction," illustrated; J. H. Sutter, "Concrete Caisson Foundations for Buildings."

June 12.—P. H. Ashmead, "An Engineer's Experiences in South America and in High Altitudes," illustrated.

June 10.—W. H. Pratt, "On Modern Practice in Bridge Shop Work."

June 26.—Prof. B. E. Fernow, Ithaca, N. Y., "The Forester as Engineer," illustrated.

The Engineers' Club of Philadelphia.

A regular meeting of the Club will be held on Saturday, April 20, at 8 p. m. The papers are: "Notes on the Construction of a Factory Chimney," illustrated, by I. Wendell Hubbard, and "Design and Construction of Factory Chimneys," illustrated, by Francis Schumann.

Under the title, "A New Type of Water-Tube Boiler," Mr. Henry G. Morris presented a paper at the meeting on April 6. He described a water-tube boiler invented by Mr. John C. Parker, in which the chief feature of novelty consists in an arrangement whereby the circulation is in the opposite direction to that usually employed in boilers of this class. The details of its design and construction were fully explained and illustrated by a series of drawings reproduced in the electric lantern and by a small working model. Mr. Morris was followed by the inventor, who made some remarks upon the theory and practice in designing boilers of the water-tube type, and answered some questions propounded by Mr. James Christie in a discussion which followed.

Dr. A. E. Kennelly presented a communication, in which, by the aid of lantern illustrations, he described the composition of electric cables for deep see and shore lines, the methods of carrying and laying the cables from on board ship, the location and general arrangement of cable stations and the method of sending messages from them, and the difficulties in locating and repairing breaks in the line.

Iron and Steel Institute (British).

The annual meeting of the Institute will be held at the Institution of Civil Engineers, Great George street, Westminster, on the 8th and 9th of May. As a tribute of respect to the memory of the Queen, who, in 1899, honored the Iron and Steel Institute by accepting the Bessemer Gold Medal, and by granting a royal charter of incorporation, the Council have decided that the usual annual dinner shall this year not be held. The programme of proceedings includes the presentation of the Bessemer Gold Medal for 1901 to J. E. Stead, Esq., F. I. C., and papers on: The Properties of Steel Castings, by Prof. J. O. Arnold; The Physical Properties of Steel, by J. A. Brinell (Fagersta, Sweden); The Use of Hydraulic Power in the Manufacture of Iron and Steel, by R. M. Daelen (Düsseldorf); British and American Rolling Mill Practice, by William Garrett (Cleveland, Ohio); The Effect of Copper in Steel Rails and Plates, by J. E. Stead and John Evans (Middlesbrough); and The New Bessemer Shop and Heating Pits at the Works of the Barrow Hæmatite Steel Company, Limited, by J. M. While (Barrow-in-Furness).

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. Overton Cade has been appointed a member of the Louisiana Railroad Commission, succeeding Mr. R. N. Sims, resigned.

—Mr. Martin Duvall, whose resignation as Chief Engineer of the Texas Midland we noted last week (page 259), has gone into business for himself as contractor.

—Mr. Joseph B. Hutchinson, General Manager of the Pennsylvania Railroad, and Miss Serena M. North were married on April 11 at St. Paul's Episcopal Church in Columbia, Pa.

—Mr. Russell Elliott, at one time Auditor of the Indianapolis & St. Louis Railroad (Cleveland, Cincinnati, Chicago & St. Louis), died recently at Galena, Kan. Mr. Elliott had been engaged in the mining business for the past few years.

—Mr. Sumner B. Ely, recently appointed Chief Engineer of The American Sheet Steel Co., is a nephew of Mr. Theo. N. Ely, Chief of Motive Power of the Pennsylvania Railroad and a graduate of the Massachusetts Institute of Technology.

—Capt. H. F. Hodges, Corps of Engineers U. S. Army, has been relieved from duty at Cincinnati, Ohio, and

ordered to Havana as engineer officer of the Department of Cuba, in place of Capt. W. F. Black, U. S. A., whose transfer to Willet's Point, N. Y., was noted last week. Major E. H. Ruffner, U. S. A., will relieve Capt. Hodges at Cincinnati.

—Mr. J. F. Simms, recently appointed Division Superintendent of the Missouri Pacific, is a native of Mississippi, having been born in Rankin County, July 8, 18[illegible]. He began his railroad career in 1880 as an apprentice on the old Kiksburg & Meridian Railroad, now a part of the Queen & Crescent, serving in the track department as operator. In 1889 he went to the St. Louis, Iron Mountain & Southern as operator, later becoming despatcher. In January, 1891, he became despatcher on the Western Division of the Missouri Pacific at Atchison, Kan., and in 1895 was promoted to be Chief Despatcher, which position Mr. Simms held until his recent appointment as Division Superintendent.

—Dr. Henry A. Rowland, of the John Hopkins University, died in Baltimore on Tuesday of this week, and the world loses a famous physicist and a great man of science. He was born in Honesdale, Pa., Nov. 27, 1848, was graduated at the Rensselaer Polytechnic Institute in 1870, spent two or three years in railroad civil engineering, studied under Helmholtz for a year in Berlin and in 1876 took the chair of physics at the John Hopkins in charge of the laboratories. From that time his career has been distinguished and successful. He has made inventions, has acted as consulting engineer in important electrical works, has done much to fix the terminology of the electric art and has contributed in many ways to the advancement of science. His death while still comparatively young is a great loss to the world.

—Sir Edward William Watkin died in England April 14. Sir Edward was for many years one of the most conspicuous railroad men of Great Britain. As Chairman of the South Eastern he probably was as well abused as any other man in the Kingdom. He had served also as Chairman of the Manchester, Sheffield & Lincolnshire and of the Metropolitan (underground) and had been General Manager, Director and Chairman of these and other roads. He was a man of great energy and of fertile and restless mind. The reader will perhaps remember that for years he was a stout advocate of the channel tunnel and indeed had dreamed of a railroad from Ireland by tunnel to England, then by tunnel to France, then down across Spain and by car ferry to Africa and so eventually to India. He began life as a merchant, but in 1845 began his work as a railroad officer and promoter. He was made a knight in 1868 and a baronet in 1880. He had served as a Magistrate, as High Sheriff for the county of Cheshire and in Parliament.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—E. H. Coapman, heretofore Trainmaster of the Illinois Central, has been appointed Superintendent of Terminals of the A., T. & S. F., with headquarters at The Needles, Cal. C. M. Taylor, Division Master Mechanic, with headquarters at La Junta, Col., has resigned. The jurisdiction of H. K. Gregory, Assistant General Passenger Agent of the Southern California, has been extended to include the lines west of Albuquerque.

Central of New Jersey.—George F. Baer, the new President of the Philadelphia & Reading, has been elected President of the C. of N. J. also. The following new Directors were elected April 12: Mr. Baer, J. S. Harris, J. L. Welsh, C. Steele, all Directors of the Reading, and E. B. Thomas of the Erie.

Chicago & Alton.—D. C. Morgan, Engineer Maintenance of Way, has resigned, and that position has been abolished. E. A. Richardson has been appointed General Foreman of the Locomotive Department, succeeding G. Gregg.

Chicago, Burlington & Quincy.—A. J. Cota has been appointed Division Master Mechanic, with headquarters at Beardstown, Ill., succeeding J. A. Carney, who has been transferred as Division Master Mechanic at West Burlington, Iowa.

Chicago Great Western.—E. C. Davis has been appointed Division Engineer, with headquarters at Des Moines, Iowa, succeeding H. B. Merriam, transferred.

Cleveland, Cincinnati, Chicago & St. Louis.—H. H. Knowlton has been appointed Engineer Maintenance of Way, with headquarters at Mt. Carmel, Ill., succeeding L. S. Rose, transferred.

Eastern of Minnesota.—George A. Gallagher has been appointed Master Mechanic, succeeding T. E. Adams, resigned to accept service with another company.

Houston East & West Texas.—F. B. Goodrich has been appointed Chief Engineer, succeeding E. B. Cushing. The position of General Superintendent, held by Mr. Cushing, has been abolished. D. S. Gallagher has been appointed Superintendent of Transportation.

Illinois Central.—H. U. Wallace has been appointed Superintendent of the Louisville Division, suceeding W. J. Harahan, promoted. H. Baker succeeds Mr. Wallace as Superintendent of the Freeport Division, effective April 15.

Iowa Northern.—T. N. Cooper has been appointed General Manager.

Louisville & Nashville.—S. H. Edgar has been elected Second Vice-President, with headquarters at New York City, succeeding A. M. Quarrier, deceased. G. W. Proctor succeeds Mr. Edgar as Assistant Treasurer. W. G. Oakman has been elected a Director, succeeding J. D. Probst, deceased.

Long Island.—S. S. Dennis, recently elected a Director (p. 259), has declined to serve and Clement A. Griscom has been elected in his place.

McKeesport Connecting.—The officers of this company are: President, Wm. B. Schiller; Vice-President, Frank J. Hearne; Secretary and Treasurer, A. T. Stewart; General Manager, Taylor Allderdice; General Superintendent, Peter Boyd; Traffic Manager, J. F. Townsend and Superintendent of Motive Power, George N. Riley.

Mexican Central.—Owing to ill health G. J. Hartman, Division Superintendent at Chihuahua, Mex., has been granted an indefinite leave of absence.

Mobile & Ohio (Southern).—C. H. Ackert, heretofore President and General Manager of the Chicago, Lake Shore & Eastern and the Elgin, Joliet & Eastern, has been appointed General Manager of the M. & O.

New York Central & Hudson River.—H. Fernstrom has been appointed Principal Assistant Engineer, with headquarters at Grand Central Station, New York City. (March 29, p. 229.)

Pittsburgh & Lake Erie.—W. E. Davin has been appointed Supervisor, with headquarters at McKee's Rocks.

St. Louis Southwestern.—T. F. Adams has been appointed General Master Mechanic, succeeding R. H. Johnson.

San Pedro, Los Angeles & Salt Lake.—D. W. Campbell has been appointed Chief Engineer, with headquarters at Los Angeles, Cal.

Santa Fe Pacific (A., T. & S. F.).—The headquarters of G. W. Smith, Master Mechanic, have been removed from Albuquerque, N. M., to San Bernardino, Cal. R. J. Turnbull has been appointed Division Master Mechanic, with headquarters at Albuquerque.

Southern Pacific.—E. B. Cushing, heretofore General Superintendent and Chief Engineer of the Houston East & West Texas, has been appointed Engineer Maintenance of Way of the Atlantic System of the S. P., succeeding the late J. T. Mahl.

Stony Creek.—H. U. Garrett has been appointed Superintendent of the New York Division, with headquarters at Philadelphia, Pa., succeeding E. C. Tomlinson, resigned.

Yazoo & Mississippi Valley.—T. S. Evans has been appointed Supervisor of Trains and Track, with headquarters at Jackson, Miss., succeeding J. T. Savage, transferred. Effective April 15.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—Locating surveys are reported in progress for the proposed branch from Bobbin, Tex., on the Conroe Branch, northwest 55.8 miles to Cold Spring. (Construction Supplement, March 8, 1901.)

BALTIMORE & OHIO.—Final surveys are reported made for an extension from Savage, Md., north about two miles to Guilford.

BELLINGHAM BAY & EASTERN.—Peter Larsen, of Helena, Mont., has been awarded the contract for building the extension from Lake Whatcom, Wash., to Wickersham, 15 miles. (March 15, p. 194.)

BIRMINGHAM, SELMA & NEW ORLEANS.—The citizens of Linden, Ala., have appointed a committee to confer with Colonel F. M. Abbott, President of this company, urging him to complete the line to that city as soon as possible. The company is building an extension from Martin's Station west to Thomaston, and has made surveys as far as Linden.

BOSTON & MAINE.—The directors of the Concord & Montreal, on April 3, voted to accept the charter for the electric branch from Concord, N. H., to Nashua, and surveys are in progress. (Construction Supplement, March 8, 1901.)

CAPE MAY, DELAWARE BAY & SEWELL'S POINT.—The Cape May & Delaware Bay has been merged with this company and building is in progress along the ocean front between Cape May Point and Sewell's Point.

CALIFORNIA EASTERN.—Building is reported in progress on the extension of this line from Manvel, Cal., north to Ivanpah, 10 miles, on the proposed extension to Goodsprings, Nev., 45 miles. Bright & Crandall, of San Bernardino, Cal., have the contract. (March 29, p. 229.)

CALIFORNIA ROADS.—The Scott & Van Arsdale Lumber Co., of San Francisco, has made application for right of way in the city of Stockton, and an officer writes that the company proposes to establish a lumber yard there and will probably build several spurs and switches to the Southern Pacific and the Atchison, Topeka & Santa Fe.

CAMPBELL'S CREEK.—The contractors will be at work the last of April building this proposed line in West Virginia from the Kanawha River to mines, 14 miles. Lane Bros. & Co. have the contract. The maximum curve will be 15 deg. There are two miles already built connecting with the Kanawha & Michigan, and the additional 12 miles will be a feeder It is expected to complete the extension by Oct. 20. (April 12, p. 259.) J. E. Dana, of Charleston, W. Va., is President and General Manager, and M. W. Venable, Chief Engineer. (Official.)

CASSVILLE & MONONGAHELA.—This company will build a railroad five miles long from the Baltimore & Ohio at Cassville, W. Va., to run north to the mines of the New York & West Virginia Coal Co. James A. Milholland, of Cumberland, Md., is President.

CHESAPEAKE & OHIO.—Preparations are being made, according to report, by this company and the Cleveland, Cincinnati, Chicago & St. Louis to improve the terminals at Louisville, Ky., including the building of about 8,000 ft. of additional trackage.

CHICAGO GREAT WESTERN.—R. C. Wright, Secretary of the company, has written to business men of Storm Lake, Iowa, that it is his company's intention to build a line to Omaha and Sioux City. The proposed line from Clarion, Iowa, to Sioux City would pass near Storm Lake. (April 5, p. 245.)

CHICAGO, INDIANAPOLIS & LOUISVILLE.—Between $1,500,000 and $2,000,000 will be spent, according to report, this year in improving this line, including the relaying with heavier rail, replacing of wooden bridges, culverts, etc.

CHICAGO, MILWAUKEE & ST. PAUL.—Building is reported begun for changing the narrow gage line to standard from Reno, Minn., northwest 57.55 miles to Preston.

CHICAGO, ROCK ISLAND & PACIFIC.—The work of elevating the tracks of this company in Davenport, Iowa, was begun April 11. The tracks are to be elevated about one-half mile and a new passenger station built. (Construction Supplement, March 8, 1901.)

CHOCTAW, OKLAHOMA & GULF.—With reference to the new yards now building at Haileyville, near Hartshorne, Ind. T., an officer writes that they are at the junction of the Ardmore branch, also building. They contemplate about 12 miles of track to be used as the main coal distributing yards, as well as for freight transfers, etc., to and from the junction. (April 5, p. 245.)

CLEVELAND, PAINESVILLE & EASTERN.—Building is reported authorized for an extension of this electric line east to Fairport and Ashtabula to connect with the Pennsylvania & Ohio, now being completed from Painesville to Conneaut.

COLUMBUS, DELAWARE & MARION INTERURBAN.—This company has been incorporated, with a capital of $1,000,000, to build an electric railroad from North Columbus, Ohio, north about 50 miles through Worthington, Flint and Delaware to Marion. It is proposed to award contracts at once. Officers of the new company are: T. A. Simons, Columbus, President; J. E. Lattimer, Cleveland, Vice-President; J. W. Holcomb, Cleveland, Treasurer; and O. W. Aldridge, of Columbus, Secretary.

CORNWALL & WESTERN.—Right of way is reported being obtained for this line, recently incorporated in Pennsylvania to run from Cornwall, Lebanon County, to Steelton, Dauphin County, 25 miles. B. H. Buckingham, Cornwall, is President. (March 22, p. 209.)

DENISON, BONHAM & GULF.—This company has been organized, with a capital stock of $250,000, to build a railroad from Denison, Tex., south through Bonham to the Gulf of Mexico. The officers are: President, E. D. Steger, Bonham; First Vice-President, R. C. Foster; Second Vice-President, Hugh Halsell, Bonham; Secretary, C. L. Bradford, Bonham; Treasurer, John W. Russell, Bonham.

DES MOINES, IOWA FALLS & NORTHERN.—President E. S. Ellsworth, of Iowa Falls, Iowa, announces that contracts for the Northern Division from Iowa Falls south 15 miles, will be let within the next 10 days. (March 22, p. 209.)

DETROIT & CHARLEROI.—The main line is completed with the exception of about three miles at the South Arm terminus which is to be finished about July 1. It extends from Frederic, Mich., on the Mackinac Division of the Michigan Central, northwest 45 miles via Alba, on the Grand Rapids & Indiana, to South Arm, on Line Lake, a branch of Lake Michigan. There are also a number of side tracks to be built. The officers are: President, Willis C. Ward; Vice-President, Franklin B. Ward; Secretary, Geo. K. Root; Treasurer, Chas. H. Perkins. (Construction Supplement, March 8, 1901.) The company was organized Jan. 14. (Official.)

DULUTH, ST. CLOUD, GLENCOE & MANKATO.—The directors have made arrangements for obtaining right of way between Albert Lea, Minn., and Mankato for this proposed line from Duluth, Minn., southwest 287 miles via St. Cloud and Glencoe to Albert Lea. A. H. Reed, of Glencoe, is President, and A. E. Clark, of Mankato, Attorney and Secretary. (Construction Supplement, March 8, 1901.)

FLORENCE & NORTHWESTERN.—This company has been organized at Florence, Ala., to build from that city northwest into Wayne County, Tenn.

GRAND FORKS & REPUBLIC.—The Granby Consolidated Mining & Smelting Co., Ltd., of Grand Forks, B. C., has made preliminary surveys for a railroad from Republic, Wash., to Grand Forks, about 40 miles, the object being to gather ores from Republic and immediate camps and to draw them to the company's smelter at Grand Forks. It has not yet been absolutely determined that the road will be built, but if the decision is favorable, as it probably will be, contracts will be let in about 60 days and the company hopes to complete the line in 90 days after. The bridges will be of wood only and there will be two trestles. The maximum grade is 1 per cent. The railroad company has not yet been organized. Jay P. Graves is Vice-President and General Manager of the Smelting Co., which has an office also at 30 Broad street, New York. (Official.)

GULF COAST.—The name of this company has been changed from the Gulf Coast Electric, and it is understood the intention is to build a steam road from Biloxi, Miss., to Gulfport, 12 miles, to connect with the Gulf & Ship Island which is understood to be back of the project.

HAGERSTOWN ELECTRIC.—The business men of Leitersburg, Md., are negotiating with this company for an extension of its electric line northeast about seven miles to that city.

HARTFORD & BEAVER DAM.—This company has made surveys for an electric line from Hartford, Ky., to Beaver Dam, 4.1 miles, and building is to be begun this spring. C. M. Barnett is President, and S. A. Anderson, Secretary, both of Hartford, Ky.

ILLINOIS CENTRAL.—An officer confirms the statement that the company has let contracts to C. D. Smith & Co., of Birmingham, Ala., for double-tracking between Jackson, Miss., and Crystal Springs, 25 miles. It is roughly estimated at about 650,000 cu. yds. of earthwork and is to be completed about Sept. 1. Other work will be done by the company. (April 5, p. 246.)

The citizens of Yazoo City, Miss., have subscribed the $25,000 demanded for extending the line from Belzona to Yazoo.

The contract for 40 passing sidings aggregating 21 miles, has been let to J. J. Baxter, Jacksonville, Miss., for $96,000. Mr. Baxter expects to have the grading completed in August.

INTERPROVINCIAL & JAMES BAY.—Application has been made to the Dominion Parliament to incorporate this line, with a capital stock of $1,000,000, with power to increase to $5,000,000, to build a railroad from a point on the Canadian Pacific, between Lakes Lemiscamingue and Kippewa to Lake Abbitibi, and thence to James Bay.

JEFFERSON & NORTHWESTERN.—Building is reported begun on this new line from Jefferson, Tex., northwest about 25 miles to Linden. A. D. Clark, of Dallas, Tex., is President. (Construction Supplement, March 8, 1901.)

KENTUCKY ROADS.—The Standard Asphalt Co. is building a spur three miles long from Russellville north to asphalt mines.

MISSISSIPPI ROADS.—Messrs. Thompson & Powell are building a railroad for the Carrier Lumber Co. at Sardis.

MOBILE, JACKSON & KANSAS CITY.—C. D. Smith & Co., of Birmingham, Ala., have taken the contract for 45 miles of extension from Merrill, Miss., northwest to Hattiesburg, to connect with the Gulf & Ship Island. (Construction Supplement, March 8, 1901.)

MOUNTAIN VALLEY & BAKERSFIELD.—Surveys are reported in progress for this proposed line from Bakersfield, Cal., northwest about 60 miles. A bridge has been located over Kern River. C. A. Lee, J. L. Carson and R. H. Stevens are incorporators. (Construction Supplement, March 8, 1901.)

NORTH & SOUTH.—This company was incorporated in Iowa, April 9, by men connected with the Duluth & New Orleans. It is understood that the new company is to take over the rights of way, etc., of the old. The D. & N. O. was projected from Duluth, Minn., south to New Orleans, La., and is building between Des Moines and Osage, Iowa. The incorporators of the new company

are: E. C. Hollidge, Minneapolis; T. V. Wardall, Nevada; S. M. Hanley, Minneapolis; Elwood Furnas, S. V. Wardall and Thomas Wardall, Nevada; and H. V. Bramdenburg, New York. (D. & N. O., Construction Supplement, July 27, 1900.)

NORTHERN PACIFIC.—An officer writes that a map of definite location has been filed for the Clearwater Short Line from Stites, Idaho, east via Three-Mile Creek to Camas Prairie. No authority for building has been given. (April 5, p. 246.)

He also writes that surveys have been made for a line from Carbonado to Fairfax, Wash., six miles, but building is not yet authorized.

President Mellen is reported as announcing that the company will expend $10,250,000 the coming season on improvements and rolling stock. Of this $5,000,000 will be spent in improving the roadbed between St. Paul and Portland, Ore.

NORWOOD & ST. LAWRENCE.—All the surveys are made and 200 men are at work on this line from Norwood, N. Y., to Raymondsville, 7½ miles. About two-thirds of the grading is completed and the company expects to have the road running in six weeks as far as Norfolk, and later will extend it through to the St. Lawrence River. The Remington-Martin Co., paper manufacturers of Watertown, N. Y., are the builders.

OHIO RIVER & YOUNGSTOWN.—This company has been incorporated in Ohio, with a capital stock of $10,000, to build a railroad from Youngstown to East Liverpool.

OKLAHOMA SOUTHWESTERN.—This company was incorporated in Oklahoma, April 5, with a capital stock of $1,000,000, to build a railroad from Alba, on the Atchison, Topeka & Santa Fe, to run south into Greer County. The principal office is at Guthrie. Among those interested are: K. M. MacMillan, Colorado Springs; William Lake, Colorado Springs; J. A. Fraley, of Greer County, and D. F. Smith, of Cashion, Ind. T.

OREGON RAILROAD & NAVIGATION.—Building is to be begun about May 1, according to report, in restoring the line from Washtucna, Wash., west 12 miles to Kahlatus. The road originally extended to Connell on the Northern Pacific, 30 miles west from Washtucna, and has been abandoned for a number of years.

OREGON SHORT LINE.—Building is reported begun on a switching yard at Murray, Utah, comprising about three miles of trackage for the American Smelting & Refining Co.

PENNSYLVANIA COMPANY.—The Grand Rapids & Indiana, according to report, is considering a branch from Pellston northwest about 15 miles to Cross Village, on Lake Michigan. A five-mile logging road is in operation from Pellston which will be utilized.

PITTSBURGH & CARNEGIE.—An account of the Gould plans for development of terminals at Pittsburgh, and for a connecting line of which the Pittsburgh & Carnegie is to form a part, will be found in another column.

RIVERSIDE & HARLEM.—This company has been incorporated in Illinois, with a capital stock of $2,000,000, to build a connecting line 12 miles long in the city of Chicago, between the depots of the Illinois Central and the Wisconsin Central. The incorporators and first board of directors are the following men connected with the Illinois Central: William G. Bruen, John C. Welling, Lewis T. Moore, Joseph F. Titus and Franklin Fairman, all of Chicago.

ROCHESTER & EASTERN RAPID.—The company has obtained franchises at Geneva, N. Y., for a portion of its electric line from Brighton, terminus of the Monroe avenue line of the Rochester Ry., east via Pittsford to Geneva. Among those interested are Albert E. F. White, of Detroit; Eugene H. Satterlee, of Pittsford, and John F. White, of Buffalo. (Construction Supplement, March 8, 1901.)

ST. LOUIS & NORTHEASTERN.—This company was incorporated in Illinois, April 10, with a capital stock of $50,000, to build a railroad 100 miles long from Madison through the counties of Madison, Montgomery, Christian, Shelby and Moultrie to Sullivan. The principal office is Madison. Among the incorporators are: Charles R. Kiser and Warren Champion of Madison, and George Stillwager of St. Louis, Mo.

SALMON RIVER.—This company is to be incorporated in Idaho, to build a railroad from Blackfoot, on the Oregon Short Line, to run northwest about 100 miles to Houston. Final surveys are nearly completed and the company hopes to let contracts so as to begin work about May 1. W. H. Bancroft, Vice-President and General Manager of the Oregon Short Line, Salt Lake City, Utah, is President.

SOUTH DAKOTA ROADS.—The Homestake Mining Co. has made application for a franchise to build an electric road through Lawrence County, and thence to Sundance, Wyo., into coal lands controlled by the company.

SOUTHERN.—The company is building several thousand feet of side track at Huntsville, Ala., to reach new cotton mills.

SOUTHERN MISSOURI & ARKANSAS.—Surveys are reported in progress for an extension from Poplar Bluff, Mo., to Pocahontas, Ark. The company is building from Mingo, Mo., to Poplar Bluff, 15½ miles.

STAFFORD SPRINGS STREET.—This company has made application in Connecticut for a charter for a line from Stafford Springs southwest 12 miles to Rockville. The two cities are connected at present by a steam road via Willimantic, 46 miles. The incorporators are: Alverado Howard, Christopher Allen and E. C. Dennis, Stafford Springs; Francis T. Maxwell and George Sykes, Rockville; Fred C. Hinds, Boston; Frank E. Healy, Windsor Locks; Thomas C. Perkins, Hartford.

SUNSET.—The Southern Pacific and the Atchison, Topeka & Santa Fe have joined to build this line from Gosford, Cal., near Bakersfield, to run southeast about 28 miles to Sunset in the oil fields. It is stated that all the details are completed for building the road at once. (Construction Supplement, March 8, 1901.)

TEXAS & PACIFIC.—This company has bought the Natchitoches & Red River Valley and will extend it northwest about 70 miles along the west bank of the Red River to Shreveport, La. Building is to be begun at once. The road now runs from Cypress north 16 miles through Natchitoches.

TEXAS SHORT LINE.—The town of Grand Saline, Tex., has given a franchise for this proposed line from that town northeast about 15 miles to Alba, Wood County, on the Missouri, Kansas & Texas. Henry M. Strong, of Grand Saline, is President.

TOLEDO TERMINAL.—Thomas H. Tracy, of Toledo, President of the Toledo Railway & Construction Co., is reported as calling for bids for grading, track laying, trestle work, etc., for about nine miles of single track near Toledo. This is probably for the Toledo Terminal, which was recently incorporated as successor to the Manufacturers' R. R. of Toledo. (Construction Supplement, March 8, 1901.)

TOLEDO, WATERVILLE & SOUTHERN.—Right of way is asked through the village of Waterville, Ohio, for this proposed electric line from Toledo southwest through Waterville to Napoleon. The company was incorporated Jan. 2, with a capital stock of $25,000. Frank W. Coughling, of Toledo, is an incorporator. (March 15, p. 194.)

WABASH.—Surveys are completed and building will be begun soon on the Fort Wayne & Detroit line from New Haven, Ind., to Butler, passing within one-half mile of St. Joseph, on the Baltimore & Ohio, and within one-half mile of Spencerville, at which points there will be stations. Winston Bros., of Minneapolis, Minn., have the contract. The maximum grade is 0.3 of 1 per cent., and the maximum curve 2 deg. The track will be laid with 80-lb. steel. (Official.)

WATER VALLEY, CLARKSDALE & MISSISSIPPI VALLEY.—Permanent surveys are reported begun for this proposed line from Water Valley, Miss., on the Illinois Central, to run northwest 72 miles via Tocowa, Riverside, Belen and Clarksdale to Friar's Point on the Mississippi opposite Helena, Ark. All the rights of way have been obtained. Z. D. Jennings, of Water Valley, is Chairman, and H. P. Farrar, of Clarksdale, Chief Engineer. (Construction Supplement, March 8, 1901.)

WESTERN MARYLAND.—An officer confirms the statement that the company will build a second track between Williamsport, Md. (Potomac Valley Junction), and Hagerstown. They also propose to build 6½ miles of second track between Hagerstown and Wingerton on the Washington & Franklin; about four miles of second track in the vicinity of Chambersburg, and will make a number of extensive siding improvements between Cherry Run and Shippensburg. The work is already under contract to Chas. E. Stewart, of Westminster, Md., with the exception of the bridge work which has been let to the American Bridge Co. (April 12, p. 260.)

WHEELING & LAKE ERIE.—Contracts are reported let for tunnelling and grading on the extension from Adena, Ohio, to Bellaire. (April 12, p. 260.)

WHITEHALL & GRANVILLE.—The New York State Railroad Commissioners have granted right of way to this company for its proposed electric line in New York state which is projected from Whitehall, N. Y., southeast to West Pawlet, Vt., with a branch from Granville to Lake St. Catharine and South Poultney, Vt., 20.14 miles being in New York and 8.41 miles in Vermont. Charles I. Baker, 10 Hall Bldg., Troy, N. N., is interested. (Construction Supplement, March 8, 1901.)

WISCASSET, WATERVILLE & FARMINGTON.—This company has been incorporated in Maine, with a capital stock of $200,000. The incorporators are: E. P. Borden and J. C. Gill, Philadelphia; Leonard Atwood, Farmington, Me.; P. H. Stubbs, Strong; G. P. Farley and W. D. Patterson, Wiscasset; F. C. Thayer, Waterville.

WISCONSIN WESTERN.—This company is conferring with the people of Hillsboro, Wis., for an extension of the railroad from La Farge northeast about 15 miles via Rockton and Valley to that city. It will probably be extended on to the Chicago & Northwestern.

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—A trust agreement has been made by this company with the Standard Trust Co., to secure an issue of $10,000,000 4 per cent. car trusts, part of which are to mature each Dec. 1. The property against which the trusts are issued embraces 100 locomotives, 4,000 steel gondola cars, 2,500 box cars, 2,000 steel hopper cars and 500 flat cars.

BRAINERD & NORTH MINNESOTA.—Application is to be made by the Northern Pacific to increase the capital stock of the Minnesota & International from $100,000 to $600,000, to absorb the Brainerd & Northern Minnesota. The latter line extends from Brainerd, Minn., to Walker, 59.13 miles, and from Walker to Bemidji, 31.79 miles. The latter section was opened Dec. 17, 1898.

CHICAGO, BURLINGTON & QUINCY.—According to an interview with President Hill of the Great Northern, at St. Paul, arrangements are completed for taking over this property by the Great Northern and the Northern Pacific. The terms are not yet announced.

CINCINNATI SOUTHERN.—The trustees of the company, on April 16, by a vote of three to two, accepted a compromise of the offer of President Spencer, of the Southern Ry., made on Feb. 28. By the terms of the proposed lease, the Cincinnati Southern is to be taken over for 60 years from Oct. 11, 1906, at an annual rental of $1,050,000, for the first 20 years, $1,100,000 for the next 20 years, and $1,200,000 for the last 20 years. The trustees are to issue bonds for $2,500,000 for terminal facilities in Cincinnati, in consideration of which the lessee is to pay an additional rental equal to the interest on the bonds, and 1 per cent. in addition as a sinking fund to redeem the bonds at maturity. This proposition is to be acted upon by President Spencer, and if accepted, must receive the approval of the citizens of Cincinnati. (March 15, p. 194.)

DALLAS, FORT WORTH & GULF.—Suit has been brought in the U. S. Court at Dallas, Tex., by the Southern Pacific, alleging a contract to sell this property, including the Dallas Terminal, within 60 or 90 days, and demanding a compliance with the contract. The agreement was made with the late C. P. Huntington, and the counterclaim is made that the conditions were not complied with by the Southern Pacific.

LITTLE KANAWHA.—Judge Jackson, in the U. S. Court at Parkersburg, W. Va., appointed Gov. A. B. White, C. H. Shattuck and Dennis O'Brien receivers for this line, which runs from Parkersburg, W. Va., to Palestine, 30 miles. It was chartered in May, 1896, to build from Parkersburg to Burnsville, 112 miles. The receivership is said to be due to the failure of New York capitalists who held an option to take over the road, and to the threat of contractors who built it to foreclose a mortgage.

MEXICAN CENTRAL.—The officers of this company have issued a circular to stockholders calling for proxies to be issued by them for the continuation of the control of the property at the stockholders' meeting on May 1 next. As already stated, W. L. Stow & Co., New York, are said to have acquired in the open market a majority of the stock. (April 5, p. 246.)

MEXICAN NATIONAL.—Six per cent. 40-year first mortgage bonds of 1887, to the par value of $114,000, have been drawn for payment June 1 in London at par. A further block of $62,000 has been drawn for payment on Dec. 1. (July 13, 1900, p. 488.)

METROPOLITAN WEST SIDE ELEVATED (CHICAGO).—The issue of $5,000,000 extension bonds, authorized April 8, is to be a first lien on future lines, and a second lien on the present property. The intention is to sell about $1,500,000 to provide for the immediate building of two extensions, one on Garfield Park Line from West Forty-eighth avenue to West Fifty-second avenue, one-half mile, and the other an extension of the Douglas Park branch to West Fortieth avenue, 1.85 miles. (April 12, p. 260.)

MINERAL RANGE.—Amended articles of association have been filed in Michigan increasing the company's capital stock from $393,400 to $800,000.

MISSOURI, KANSAS & TEXAS.—The North American Trust Co., and Lawrence Barnham & Co., New York, offer $350,000 first mortgage 6 per cent. gold bonds of the Southwestern Coal & Improvement Co., guaranteed by the M., K. & T.

NATCHITOCHES & RED RIVER VALLEY.—See Railroad Construction column.

NEW ALBANY BELT & TERMINAL.—This property was sold at auction, April 11, to representatives of the Southern Ry., for $50,000. The line is used by the St. Louis Division for entrance through New Albany to Louisville over the Kentucky & Indiana Bridge.

NEW ORLEANS & WESTERN.—The receivers' certificates have been paid, with interest, to March 11, at the Standard Trust, New York. According to Mr. C. B. Van Nostrand, the property will continue to be an independent terminal. The new company, it is stated, will be organized, called the New Orleans Belt & Terminal, with a capital stock of $1,000,000 and an authorized issue of first mortgage 4s for $2,500,000. (March 15, p. 194.)

NORFOLK & WESTERN.—The stockholders of the Cincinnati Connecting Belt and the Cincinnati, Portsmouth & Virginia, on April 9, voted to merge these properties preparatory to transferring them to the N. & W. (March 22, p. 210.)

NORTHERN CENTRAL.—The company, it is stated, will take to the U. S. Supreme Court the case decided against it by the Maryland Court of Appeals, with reference to the annuity of $90,000 a year, which the railroad is obligated to pay the state. The company has offered a lump sum of $1,500,000, which offer is declined. (March 15, p. 194.)

Bonds issued under the consolidated general mortgage have been drawn for payment in London and Baltimore on July 1 as follows: Series A, £23,400 ($117,000 gold), and series B, £11,800 ($59,000 gold), in all 176 bonds amounting to £35,200.

PANAMA.—The 51st annual report for the year ended Dec. 31, 1900, shows that the gross earnings were $2,655,195, a gain of $460,153 over 1899, or 15.65 per cent. The increase in net earnings was $75,133. The gains resulted chiefly from the increased traffic eastbound, being a gain of 44.51 per cent. in tonnage against only 4.96 per cent. gain in the westbound freight. The gross earnings per ton moved in both directions were $3.09, against $3.32 in 1899. Passenger earnings increase 20.14 per cent., from $63,646 in 1899, to $76,467 last year. There was a heavy falling off in average receipts for second-class through passengers due to the low rate received on laborers proceeding from Jamaica to Guayaquil. During the year work was completed on the new port and terminals at La Boca, including the deepening of the channel so that vessels may now for the first time load and discharge directly at the dock. The long-standing contract with the Pacific Mail Steamship Co. expired last year and the company has refused to make any other exclusive contract, inaugurating an "open door policy." As a result of this change and of the increased traffic the company is seriously considering building new ships for its Atlantic line, and the possible extension of the service to ports other than New York. Upon the Pacific side the increased traffic has been met by the charter of vessels of American registry.

QUINCY, OMAHA & KANSAS CITY.—The Guaranty Trust Co. is paying off its certificates issued against the depositors of old first mortgage 5s, holders of each $1,000 certificate receiving $713.53 in cash.

ST. LOUIS & SAN FRANCISCO.—Eleven first mortgage 6 per cent. bonds of the Fort Smith & Van Buren Bridge have been drawn for payment at 105 and interest at the Mercantile Trust Co., New York, on Oct. 1, interest to cease from that date. (June 8, 1900, p. 380.)

SAN FRANCISCO & SAN MATEO ELECTRIC OF SAN FRANCISCO.—This property has been bought by a Baltimore syndicate for $1,600,000, with the intention of extending the line ultimately to San Jose. The syndicate is composed as follows: J. B. Ramsey, of the firm of Jenkins Bros.; George R. Webb, Henry A. Parr, Henry I. Bowdoin, Vice-President of the Maryland Trust Co.; William H. Bosley, J. L. Blackwell, Wesley M. Oler, James A. Gary, Seymour Mandelbaum and others.

SEABOARD AIR LINE.—The directors, on April 10, voted to call $2,483,000 5 per cent. preference bonds of the Georgia & Alabama for payment at 105 on July 1. They also voted to dissolve the S. A. L. first mortgage 4 per cent. bond pool and to issue new first mortgage bonds in exchange for the bond certificates on June 1.

SIOUX CITY & PACIFIC.—By the official call issued by the Secretary of the Treasury, this property is to be sold at public auction at the office of the Solicitor of the Treasury in Washington, D. C., on June 20, at 12 o'clock noon. The sale is to carry all the claims of the United States against the company, and is subject to a first mortgage of $1,628,000, with interest. The upset price is $1,872,000 and each bidder must deposit $100,000. Within 20 days from the sale full payment is to be made by the successful purchaser. (April 12, p. 260.)

TENNESSEE CENTRAL.—A new charter has been granted to this company under the title of the Tennessee Central Ry. Co., whereby it is to include the lease of the Nashville & Knoxville, and to build between Nashville and Lebanon. (March 22, p. 210.)

UNADILLA VALLEY.—Notice has been filed at Utica, N. Y., for the foreclosure of the mortgage given by this company to the Central Trust Co. This action will permit the issuing of bonds to build the proposed extension from New Berlin to Oneonta, N. Y. (March 22, p. 210.)